International Telecommunication Union

Conference Preparatory Meeting

CPM Report on technical, operational and regulatory/procedural matters to be considered by the 2007 World Radiocommunication Conference

(Geneva, 2007)

Radiocommunication Sector

International Telecommunication Union

Preface

This CPM Report to the 2007 World Radiocommunication Conference (WRC-07) was prepared in response to Resolution 1227 of the ITU Council to assist those who will be involved in the preparations for and deliberations at WRC-07. The Report was prepared and approved by the CPM at its second meeting, 19 February-2 March 2007. The Report is structured to follow the topics of the WRC-07 Agenda and its contents follow the outline approved by the first meeting of the CPM which was held during the week following WRC-03. A cross-reference list is provided to facilitate finding specific topics within the framework of the WRC-07 Agenda. This Report comprises seven Chapters and one Annex**.**

The Report represents the best information on technical, operational and regulatory/procedural issues relevant to the WRC-07 Agenda available at the time of its preparation and should provide a good basis for the discussions at the Conference.

Valery Timofeev
Director Radiocommunication Bureau

Cross-reference between the WRC-07 agenda items and the chapters of the CPM Report

WRC-07 agenda item		Part of the CPM Report to WRC-07
1	on the basis of proposals from administrations, taking account of the results of WRC-03 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the bands under consideration, to consider and take appropriate action with respect to the following items:	
1.1	requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, in accordance with Resolution **26 (Rev.WRC-97)**	Not in scope of CPM
1.2	to consider allocations and regulatory issues related to the Earth exploration-satellite (passive) service, space research (passive) service and the meteorological satellite service in accordance with Resolutions **746 (WRC-03)** and **742 (WRC-03)**	Chapter 2 (Page 6)
1.3	in accordance with Resolution **747 (WRC-03)**, consider upgrading the radiolocation service to primary allocation status in the bands 9 000-9 200 MHz and 9 300-9 500 MHz and extending by up to 200 MHz the existing primary allocations to the Earth exploration-satellite service (EESS) (active) and the space research service (SRS) (active) in the band 9 500-9 800 MHz without placing undue constraint on the services to which the bands are allocated	Chapter 1 (Page 7)
1.4	to consider frequency-related matters for the future development of IMT-2000 and systems beyond IMT-2000 taking into account the results of ITU-R studies in accordance with Resolution **228 (Rev.WRC-03)**	Chapter 1 (Page 20)
1.5	to consider spectrum requirements and possible additional spectrum allocations for aeronautical telecommand and high bit-rate aeronautical telemetry, in accordance with Resolution **230 (WRC-03)**	Chapter 1 (Page 43)
1.6	to consider additional allocations for the aeronautical mobile (R) service in parts of the bands between 108 MHz and 6 GHz, in accordance with Resolution **414 (WRC-03)** and, to study current satellite frequency allocations, that will support the modernization of civil aviation telecommunication systems, taking into account Resolution **415 (WRC-03)**	Chapter 1 (Page 61)
1.7	to consider the results of ITU-R studies regarding sharing between the mobile-satellite service and the SRS (passive) in the band 1 668-1 668.4 MHz, and between the mobile-satellite service and the mobile service in the band 1 668.4-1 675 MHz in accordance with Resolution **744 (WRC-03)**	Chapter 3 (Page 6)

WRC-07 agenda item		Part of the CPM Report to WRC-07
1.8	to consider the results of ITU-R studies on technical sharing and regulatory provisions for the application of high altitude platform stations operating in the bands 27.5-28.35 GHz and 31-31.3 GHz in response to Resolution **145 (WRC-03),** and for high altitude platform stations operating in the bands 47.2-47.5 GHz and 47.9-48.2 GHz in response to Resolution **122 (Rev.WRC-03)**	Chapter 4 (Page 6)
1.9	to review the technical, operational and regulatory provisions applicable to the use of the band 2 500-2 690 MHz by space services in order to facilitate sharing with current and future terrestrial services without placing undue constraint on the services to which the band is allocated	Chapter 3 (Page 21)
1.10	to review the regulatory procedures and associated technical criteria of Appendix **30B** without any action on the allotments, the existing systems or the assignments in the List of Appendix **30B**	Chapter 6 (Page 7)
1.11	to review sharing criteria and regulatory provisions for protection of terrestrial services, in particular terrestrial television broadcasting services, in the band 620-790 MHz from broadcasting-satellite service networks and systems, in accordance with Resolution **545 (WRC-03)**	Chapter 3 (Page 45)
1.12	to consider possible changes in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference: “Advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks” in accordance with Resolution **86 (WRC-03)**	Chapter 6 (Page 128)
1.13	taking into account Resolutions **729 (WRC-97)**, **351 (WRC-03)** and **544 (WRC-03)**, to review the allocations to all services in the HF bands between 4 MHz and 10 MHz, excluding those allocations to services in the frequency range 7 000-7 200 kHz and those bands whose allotment plans are in Appendices **25**, **26** and **27** and whose channelling arrangements are in Appendix **17**, taking account of the impact of new modulation techniques, adaptive control techniques and the spectrum requirements for HF broadcasting	Chapter 5 (Page 6)
1.14	to review the operational procedures and requirements of the Global Maritime Distress and Safety System (GMDSS) and other related provisions of the Radio Regulations, taking into account Resolutions **331 (Rev.WRC-03)** and **342 (Rev.WRC-2000)** and the continued transition to the GMDSS, the experience since its introduction, and the needs of all classes of ships	Chapter 5 (Page 50)

WRC-07 agenda item		Part of the CPM Report to WRC-07
1.15	to consider a secondary allocation to the amateur service in the frequency band 135.7-137.8 kHz	Chapter 5 (Page 111)
1.16	to consider the regulatory and operational provisions for Maritime Mobile Service Identities (MMSIs) for equipment other than shipborne mobile equipment, taking into account Resolutions **344 (Rev.WRC-03)** and **353 (WRC-03)**	Chapter 5 (Page 115)
1.17	to consider the results of ITU-R studies on compatibility between the fixed-satellite service and other services around 1.4 GHz, in accordance with Resolution **745 (WRC-03)**	Chapter 3 (Page 68)
1.18	to review pfd limits in the band 17.7-19.7 GHz for satellite systems using highly inclined orbits, in accordance with Resolution **141 (WRC-03)**	Chapter 4 (Page 24)
1.19	to consider the results of the ITU-R studies regarding spectrum requirement for global broadband satellite systems in order to identify possible global harmonized fixed-satellite service frequency bands for the use of Internet applications, and consider the appropriate regulatory/technical provisions, taking also into account No. **5.516B**	Chapter 4 (Page 47)
1.20	to consider the results of studies, and proposals for regulatory measures if appropriate regarding the protection of the EESS (passive) from unwanted emissions of active services in accordance with Resolution **738 (WRC-03)**	Chapter 2 (Page 27)
1.21	to consider the results of studies regarding the compatibility between the radio astronomy service and the active space services in accordance with Resolution **740 (WRC-03)**, in order to review and update, if appropriate, the tables of threshold levels used for consultation that appear in the Annex to Resolution **739 (WRC-03)**	Chapter 2 (Page 43)
2	to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-03)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with principles contained in the Annex to Resolution **27 (Rev.WRC-03)**	Chapter 7 (Page 4)

WRC-07 agenda item		Part of the CPM Report to WRC-07
3	to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the Conference	Not in scope of CPM
4	in accordance with Resolution **95 (Rev.WRC-03)**, to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation	Chapter 7 (Page 15)
5	to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention	Chapter 7 (Page 31)
6	to identify those items requiring urgent action by the Radiocommunication Study Groups in preparation for the next world radiocommunication conference	Chapter 7 (Page 31)
7	in accordance with Article 7 of the Convention:	
7.1	to consider and approve the Report of the Director of the Radiocommunication Bureau: on the activities of the Radiocommunication Sector since WRC-03; on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and on action in response to Resolution **80 (Rev.WRC-2000)**	Chapter 6* (Page 32) Chapter 7 (Page 32)
7.2	to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution **803 (WRC-03)**	Chapter 7 (Page 70)

* Consideration of the status of ITU-R studies under Agenda item 7.1 is contained in Chapter 7 of the CPM Report.

List of the radio services abbreviations

Abbreviations	Radio services	RR definition
AMS	aeronautical mobile service	No. **1.32**
AM(R)S	aeronautical mobile (route) service	No. **1.33**
AMSS	aeronautical mobile-satellite service	No. **1.35**
AMS(R)S	aeronautical mobile-satellite (route) service	No. **1.36**
ARNS	aeronautical radionavigation service	No. **1.46**
ARNSS	aeronautical radionavigation-satellite service	No. **1.47**
AS	amateur service	No. **1.56**
ASS	amateur-satellite service	No. **1.57**
BS	broadcasting service	No. **1.38**
BSS	broadcasting-satellite service	No. **1.39**
EESS	Earth exploration-satellite service	No. **1.51**
FS	fixed service	No. **1.20**
FSS	fixed-satellite service	No. **1.21**
ISS	inter-satellite service	No. **1.22**
LMS	land mobile service	No. **1.26**
LMSS	land mobile-satellite service	No. **1.27**
MetAids	meteorological aids service	No. **1.50**
MetSat	meteorological-satellite service	No. **1.52**
MMS	maritime mobile service	No. **1.28**
MMSS	maritime mobile-satellite service	No. **1.29**
MRNS	maritime radionavigation service	No. **1.44**
MRNSS	maritime radionavigation-satellite service	No. **1.45**
MS	mobile service	No. **1.24**
MSS	mobile-satellite service	No. **1.25**
RAS	radio astronomy service	No. **1.58**
RDS	radiodetermination service	No. **1.40**
RDSS	radiodetermination-satellite service	No. **1.41**
RLS	radiolocation service	No. **1.48**
RLSS	radiolocation-satellite service	No. **1.49**
RNS	radionavigation service	No. **1.42**
RNSS	radionavigation-satellite service	No. **1.43**
SOS	space operation service	No. **1.23**
SRS	space research service	No. **1.55**

Other abbreviations:

RR	Radio Regulations
No.(Nos.)	footnote(s) in Article **5** or number of the provisions in an Article of the RR
RRC-06	Regional Radiocommunication Conference 2006 (Geneva, 15 May-16 June 2006)
DNR (DRR)	Draft new Recommendation (Draft revised Recommendation)
PDNR (PDRR)	Preliminary DNR (Preliminary DRR)
BR	Radiocommunication Bureau
GSO	geostationary-satellite orbit
non-GSO	non-geostationary-satellite orbit
AMT	aeronautical mobile telemetry

CPM Report to WRC-07

CONTENTS

I Introduction to the CPM Report to WRC-07

This CPM Report to WRC-07 is provided to assist the ITU Member States and the Radiocommunication Sector Members who will be involved in preparations for the 2007 World Radiocommunication Conference. It represents the best information on technical, operational and regulatory/procedural issues relevant to the WRC-07 agenda, available at the time of its preparation.

I.1 Origin and purpose of CPM-07

As announced by the Secretary-General in Circular Letters No. 148 and DM-06/1041 of 28 November 2006, a World Radiocommunication Conference (WRC-07) will be held from 22 October to 16 November 2007, immediately following the Radiocommunication Assembly (RA-07). The conditions for invitation and admission to the World Radiocommunication Conference are specified in Article 24 of the Convention and are in accordance with Plenipotentiary Conference Resolutions COM5/3 (Antalya, 2006), 14 (Rev. Antalya, 2006) and 6 (Kyoto, 1994). Further details to assist members with their preparation for WRC-07 are provided in Administrative Circular CA/165 of 22 January 2007. The agenda for WRC-07 is as approved by Council 2004 in its Resolution 1227 (see Annex I-1), on the basis of Resolution 802 (WRC-03).

The 2003 Radiocommunication Assembly by its Resolution ITU-R 2-4 reconfirmed that preparatory studies for the WRC are to be carried out by a Conference Preparatory Meeting (CPM) and appointed Mr Kavouss Arasteh (Islamic Republic of Iran) as the Chairman of CPM-07 and Mr Maurice Ghazal (Lebanon) and Mr Albert Nalbandian (Armenia) as the Vice-Chairmen.

All administrations of the ITU Member States and the Radiocommunication Sector Members were invited to participate in the preparation of the CPM Report to WRC-07.

I.2 Organization of the ITU-R preparation for the conference

The organization of the conference preparatory work is shown in Fig. I-1.

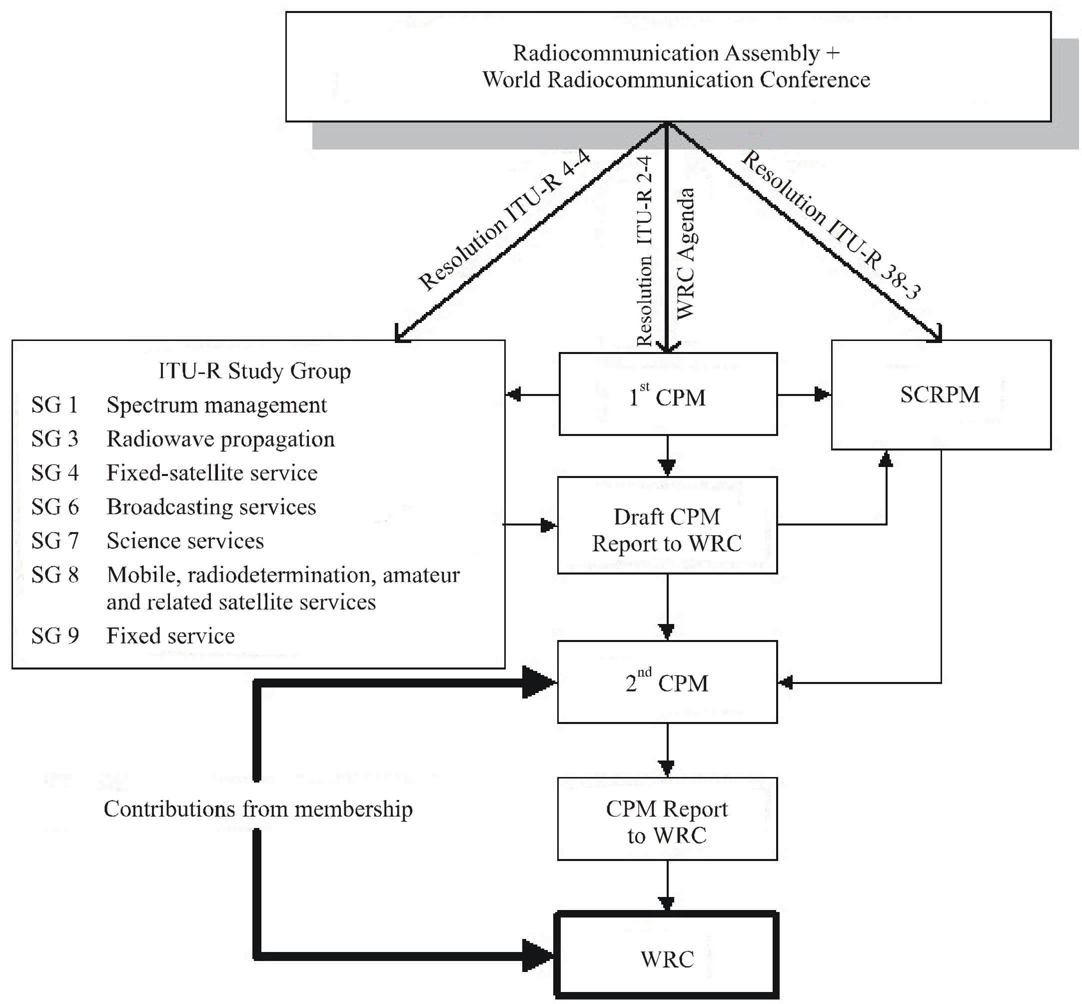
On the basis of contributions from administrations, the Radiocommunication Study Groups, the Special Committee, and other sources concerning the technical, operational and regulatory and procedural matters to be considered by radiocommunication conferences, the CPM prepares a consolidated report for such conferences (see Resolution ITU-R 2-4).

The first Conference Preparatory Meeting (Geneva, 7-8 July 2003) organized preparatory studies for WRC-07 and identified studies for the following WRC. A structure for the CPM Report to WRC-07 was agreed together with a preparatory process, working procedures and a chapter structure. The meeting appointed a Rapporteur for each chapter to assist the Chairman in managing the development and flow of draft report contributions.

The meeting also decided that all appropriate regulatory and procedural studies on relevant agenda items would be carried out by the Special Committee on Regulatory/Procedural matters (SCRPM), activated by WRC-2003 in accordance with Resolution ITU-R 38-3, on the basis of proposals from the membership of the ITU and the relevant ITU-R Study Groups and their Working Parties, Task Groups and Joint Task Groups. According to Resolution ITU-R 38-3 the results of the studies shall be submitted as contributions to the work of the CPM in preparing its report to the relevant WRC.

FIGURE I-1

Organization of the ITU-R conference preparatory work



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The ITU-R preparations for WRC-07 were concentrated in the following groups (listed in the order of the Study Groups):

Study Group 1 chaired by Mr T. Jeacock (United Kingdom) and subsequently succeeded by Mr R. H. Haines (United States), WP 1A chaired by Mr J. Wang (China), WP 1B chaired by Mr B. Chaudhuri (India) with Ms L. Jeanty (Netherlands) acting as Chairman for one meeting and TG 1/9 chaired by Mr V. Meens (France).

Study Group 3 chaired by Mr D.G. Cole (Australia) and subsequently succeeded by Mr B. Arbesser-Rastburg (ESA), provided technical support on radiowave propagation matters where needed, WP 3K chaired by Mr R. Grosskopf (Germany), WP 3L chaired by Mr J. Wang (United States), WP 3M chaired by Ms C. Wilson (Australia).

Study Group 4 chaired by Ms V. Rawat (Canada), WP 4A chaired by Mr A.G. Reed (United Kingdom), WP 4B chaired by Mr D. Weinreich (United States) and WP 4-9S chaired by Mr W. Rummler (United States).

Study Group 6 chaired by Mr A. Magenta (Italy), WP 6E chaired by Mr L. Olson (United States), WP 6J co-chaired by S. Lieng (Australia), Mr V. Stepanian (Iran (Islamic Republic of)) and Mr P. Zaccarian (Italy), WP 6S chaired by Mr C. Dosch (Germany) and JTG 6-8-9 chaired by Mr M. Dupuis (Canada).

Study Group 7 chaired by Mr R.M. Taylor (United States), WP 7B chaired by Ms S. Taylor (United States), WP 7C chaired by Mr E. Marelli (ESA), WP 7D chaired by Mr M. Ohishi (Japan).

Study Group 8 chaired by Mr C. van Diepenbeek (Netherlands), WP 8A chaired by Mr S. Towaij (Canada) and subsequently succeeded by Mr J.M. Costa (Canada), WP 8B chaired by Mr R. Swanson (United States) and subsequently succeeded by Mr T. Ewers (Germany), WP 8D chaired by Mr T. Mizuike (Japan) and WP 8F chaired by Mr S. Blust (United States).

Study Group 9 chaired by Mr V. Minkin (Russia), WP 9A chaired by Mr E. Lensson (Australia) subsequently succeeded by Ms L. Soussi (Tunisia), WP 9B chaired by Mr A. Hashimoto (Japan), WP 9C chaired by Mr N.M. Serinken (Canada) and WP 9D chaired by Ms K. Medley (United States).

The Special Committee on Regulatory/Procedural Matters (SCRPM) chaired by Mr F. Rancy (France) provided the regulatory and procedural texts.

I.3 Preparation of the CPM Report to WRC-07

A draft CPM Report had been prepared by the Chapter Rapporteurs and the Chairmen of the relevant SGs, TGs and WPs on the basis of contributions from the relevant groups. The work was coordinated by the Chairman of CPM-07, in consultation with the CPM-07 Vice-Chairmen and Chapter Rapporteurs. Staff of the Radiocommunication Bureau provided the required assistance, in particular during the CPM Management Team meeting held in Geneva from 25 to 29 September 2006. The draft CPM Report was distributed to all Member States and to of the Radiocommunication Sector Members as Document CPM07-2/1.

The SCRPM met in Geneva from 5 to 8 December 2006, reviewed the regulatory and procedural aspects of the draft CPM Report and prepared its report to the second session of CPM07, which was distributed to all Member States and to of the Radiocommunication Sector Members as Document CPM07-2/2 with its Corrigendum 1 and Addendum 1.

The second session of CPM-07 met in Geneva from 19 February to 2 March 2007 under the chairmanship of Mr Kavouss Arasteh (Iran (Islamic Republic of)) to consider the draft CPM Report (Document CPM07-2/1) together with the SCPRM Report (Document CPM07-2/2), contributions from the ITU membership and additional material submitted by the Radiocommunication Bureau.

About 1066 participants represented 103 Member States and 57 Radiocommunication Sector Members, including international organizations.

103 input contributions including the draft CPM Report (Document CPM07-2/1) and the SCPRM Report (Document CPM07-2/2) were submitted for consideration by the second session of CPM07.

At CPM07-2, the contributions were attributed to Working Groups 1 to 7 for preparation of the final text for each Chapter according to the following adopted structure:

Chairman, CPM-07	Mr K. Arasteh (Iran (Islamic Republic of))
Vice-Chairman, CPM-07	Mr M. Ghazal (Lebanon)
Vice-Chairman, CPM-07	Mr A. Nalbandian (Armenia)
Chairman, SCRPM	Mr F. Rancy (France)
Rapporteur of the Plenary	Ms L.M. Assefa (United States of America)
Secretary, CPM-07	Mr Ph. Aubineau (ITU BR)

CPM07-2 Working Group	Part of the draft CPM Report (WRC-07 agenda item (AI))	Topic	WG Chairman	ITU BR Secretary
WG 1	Chapter 1 (AI: 1.3, 1.4, 1.5, 1.6)	Mobile, aeronautical mobile, radionavigation, and radiolocation services	AI 1.3, 1.4: Ms D. Drazenovich (United States) AI 1.5, 1.6: Mr A.R. Jamieson (New Zealand)	M. C. Langtry
WG 2	Chapter 2 (AI: 1.2, 1.20, 1.21)	Space science services	Ms S. Taylor (United States)	Mr A. Vassiliev
WG 3	Chapter 3 (AI: 1.7, 1.9, 1.11, 1.17)	FSS, MSS and BSS below 3 GHz	Mr N. Bin Hammad (United Arab Emirates)[1]	Mr N. Venkatesh
WG 4	Chapter 4 (AI: 1.8, 1.18, 1.19)	FS including HAPS and FSS above 3 GHz	Mr A. Hashimoto (Japan)	Mr R. Mehrotra
WG 5	Chapter 5 (AI: 1.13, 1.14, 1.15, 1.16)	Services in LF, MF and HF bands and maritime mobile service	Mr P. Länsman (Finland)	Mr N. Vassiliev
WG 6	Chapter 6 (AI: 1.10, 1.12, 7.1)	Regulatory procedures and associated technical criteria applicable to satellite networks	Mr G. Taillefer (France)	Mr N. Malaguti
WG 7	Chapter 7 (AI: 2, 4, 5, 6, 7.1, 7.2	Future WRC programmes and other issues	Mr A. Nalbandian (Armenia)	Mr G. Mesias

[1] The WG 3 chairmanship was undertaken by Mr M. Dupuis (Canada) during Mr Bin Hammad’s absence due to the death of his grandfather.

* Resolution **80 (Rev.WRC-2000)**, and inconsistencies and difficulties encountered in the application of the RR.

** Status of ITU-R studies, including those referred to in the footnote of Annex 5 of Administrative Circular CA/128 of 29 July 2003, which are to be reported by the Director to WRC-07 and for which the Director was kindly requested to consider the possibility of providing any information relevant to the activities of the CPM, if available.

No editorial group was setup for the CPM due to the fact that the CPM is not preparing texts of a treaty nature and that the CPM Report to WRC-07 will be aligned in all official ITU languages before being forwarded to the membership, at least six months before the start of WRC-07.

The meeting was successful in approving the CPM Report to WRC-07.

I.4 Presentation and structure of the Report

The Report is structured to follow the topics of the WRC-07 agenda. Its outline was developed and approved by the first CPM at its meeting in July 2003 (see the results of the first CPM in Administrative Circular CA/128 of 29 July 2003 and its Addenda 1 to 4 of 23 July 2004, 16 December 2004, 25 November 2005 and 16 February 2006 respectively). A cross-reference list between the Chapters of this Report and the WRC-07 agenda items is provided at the beginning of this Report to facilitate the identification of specific topics within the framework of the WRC-07 agenda.

The Report comprises seven Chapters, defined in accordance with the adopted structure described in § I.3 above.

The Report also contains an Annex providing a list of the ITU-R Recommendations including certain draft new and revised Recommendations which are referred to in the text of the Report. The final version of this list reflecting the decisions of the 2007 Radiocommunication Assembly will be prepared by the Radiocommunication Bureau and made available to the 2007 World Radiocommunication Conference.

ANNEX I-1

RESOLUTION 1227

Agenda for the World Radiocommunication Conference (WRC-07)

The Council,

noting

that Resolution 802 of the World Radiocommunication Conference (Geneva, 2003):

a) resolved to recommend to the Council that a world radiocommunication conference be held in 2007 for a period of four weeks;

b) recommended its agenda, and invited the Council to finalize the agenda and arrange for the convening of WRC-07 and to initiate as soon as possible the necessary consultation with Member States,

resolves

to convene a World Radiocommunication Conference (WRC-07) in Geneva (Switzerland) from 8 October to 2 November 2007 with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC-03 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the bands under consideration, to consider and take appropriate action with respect to the following items:

1.1 requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, in accordance with Resolution **26 (Rev.WRC-97)**;

1.2 to consider allocations and regulatory issues related to the Earth exploration-satellite (passive) service, space research (passive) service and the meteorological satellite service in accordance with Resolutions **746 (WRC-03)** and **742 (WRC-03)**;

1.3 in accordance with Resolution **747 (WRC-03)**, consider upgrading the radiolocation service to primary allocation status in the bands 9 000-9 200 MHz and 9 300-9 500 MHz and extending by up to 200 MHz the existing primary allocations to the Earth exploration-satellite service (EESS) (active) and the space research service (SRS) (active) in the band 9 500-9 800 MHz without placing undue constraint on the services to which the bands are allocated;

1.4 to consider frequency-related matters for the future development of IMT-2000 and systems beyond IMT-2000 taking into account the results of ITU-R studies in accordance with Resolution **228 (Rev.WRC-03)**;

1.5 to consider spectrum requirements and possible additional spectrum allocations for aeronautical telecommand and high bit-rate aeronautical telemetry, in accordance with Resolution **230 (WRC-03)**;

1.6 to consider additional allocations for the aeronautical mobile (R) service in parts of the bands between 108 MHz and 6 GHz, in accordance with Resolution **414 (WRC-03)** and, to study current satellite frequency allocations, that will support the modernization of civil aviation telecommunication systems, taking into account Resolution **415 (WRC-03)**;

1.7 to consider the results of ITU-R studies regarding sharing between the mobile-satellite service and the SRS (passive) in the band 1 668-1 668.4 MHz, and between the mobile-satellite service and the mobile service in the band 1 668.4-1 675 MHz in accordance with Resolution **744 (WRC-03)**;

1.8 to consider the results of ITU-R studies on technical sharing and regulatory provisions for the application of high altitude platform stations operating in the bands 27.5-28.35 GHz and 31-31.3 GHz in response to Resolution **145 (WRC-03),** and for high altitude platform stations operating in the bands 47.2-47.5 GHz and 47.9-48.2 GHz in response to Resolution **122 (Rev.WRC-03)**;

1.9 to review the technical, operational and regulatory provisions applicable to the use of the band 2 500-2 690 MHz by space services in order to facilitate sharing with current and future terrestrial services without placing undue constraint on the services to which the band is allocated;

1.10 to review the regulatory procedures and associated technical criteria of Appendix **30B** without any action on the allotments, the existing systems or the assignments in the List of Appendix **30B**;

1.11 to review sharing criteria and regulatory provisions for protection of terrestrial services, in particular the terrestrial television broadcasting service, in the band 620-790 MHz from broadcasting-satellite service networks and systems, in accordance with Resolution **545 (WRC-03)**;

1.12 to consider possible changes in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference: “Advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks” in accordance with Resolution **86 (WRC-03)**;

1.13 taking into account Resolutions **729 (WRC-97)**, **351 (WRC-03)** and **544 (WRC-03)**, to review the allocations to all services in the HF bands between 4 MHz and 10 MHz, excluding those allocations to services in the frequency range 7 000-7 200 kHz and those bands whose allotment plans are in Appendices **25**, **26** and **27** and whose channelling arrangements are in Appendix **17**, taking account of the impact of new modulation techniques, adaptive control techniques and the spectrum requirements for HF broadcasting;

1.14 to review the operational procedures and requirements of the Global Maritime Distress and Safety System (GMDSS) and other related provisions of the Radio Regulations, taking into account Resolutions **331 (Rev.WRC-03)** and **342 (Rev.WRC-2000)** and the continued transition to the GMDSS, the experience since its introduction, and the needs of all classes of ships;

1.15 to consider a secondary allocation to the amateur service in the frequency band 135.7-137.8 kHz;

1.16 to consider the regulatory and operational provisions for Maritime Mobile Service Identities (MMSIs) for equipment other than shipborne mobile equipment, taking into account Resolutions **344 (Rev.WRC-03)** and **353 (WRC-03)**;

1.17 to consider the results of ITU-R studies on compatibility between the fixed-satellite service and other services around 1.4 GHz, in accordance with Resolution **745 (WRC-03)**;

1.18 to review pfd limits in the band 17.7-19.7 GHz for satellite systems using highly inclined orbits, in accordance with Resolution **141 (WRC-03)**;

1.19 to consider the results of the ITU-R studies regarding spectrum requirement for global broadband satellite systems in order to identify possible global harmonized fixed-satellite service frequency bands for the use of Internet applications, and consider the appropriate regulatory/technical provisions, taking also into account No. **5.516B**;

1.20 to consider the results of studies, and proposals for regulatory measures if appropriate regarding the protection of the EESS (passive) from unwanted emissions of active services in accordance with Resolution **738 (WRC-03)**;

1.21 to consider the results of studies regarding the compatibility between the radio astronomy service and the active space services in accordance with Resolution **740 (Rev.WRC-03)**, in order to review and update, if appropriate, the tables of threshold levels used for consultation that appear in the Annex to Resolution **739 (WRC-03)**;

2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution **28 (Rev.WRC-03)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with principles contained in the Annex to Resolution **27 (Rev.WRC-03)**;

3 to consider such consequential changes and amendments to the Radio Regulations as may be necessitated by the decisions of the Conference;

4 in accordance with Resolution **95 (Rev.WRC-03)**, to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation;

5 to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention;

6 to identify those items requiring urgent action by the Radiocommunication Study Groups in preparation for the next world radiocommunication conference;

7 in accordance with Article 7 of the Convention:

7.1 to consider and approve the Report of the Director of the Radiocommunication Bureau:

– on the activities of the Radiocommunication Sector since WRC-03;

– on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and

– on action in response to Resolution **80 (Rev.WRC-2000)**;

7.2 to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution **803 (WRC-03)**,

instructs the Director of the Radiocommunication Bureau

to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting and the Special Committee on Regulatory/ Procedural Matters and to prepare a report to WRC-07,

instructs the Secretary-General

1 to make all the necessary arrangements, in agreement with the Director of the Radiocommunication Bureau, for the convening of the Conference;

2 to communicate this resolution to international and regional organizations concerned.

CHAPTER 1

MOBILE, AERONAUTICAL MOBILE, RADIONAVIGATION AND RADIOLOCATION SERVICES

(Agenda items 1.3, 1.4, 1.5, 1.6)

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Agenda item 1.3

"in accordance with Resolution 747 (WRC-03), consider upgrading the radiolocation service to primary allocation status in the bands 9 000-9 200 MHz and 9 300-9 500 MHz and extending by up to 200 MHz the existing primary allocations to the Earth exploration-satellite service (EESS) (active) and the space research service (SRS) (active) in the band 9 500-9 800 MHz without placing undue constraint on the services to which the bands are allocated"

Resolution 747 (WRC-03) – Possible upgrade of the radiolocation service to primary allocation status in the frequency bands 9 000-9 200 MHz and 9 300-9 500 MHz, and possible extension of the existing primary allocations to the Earth exploration-satellite service (active) and the space research service (active) in the band 9 500-9 800 MHz

Executive summary

The CPM text on WRC-07 Agenda item 1.3 provides the results and analysis of studies, and potential methods to satisfy the agenda item taking into account the results of the studies conducted since WRC-03. Agenda item 1.3 is comprised of two distinct issues:

1) consider upgrading the radiolocation service (RLS) to primary allocation status in the bands 9 000-9 200 MHz and 9 300-9 500 MHz; and

2) consider extending the Earth exploration-satellite service (EESS) (active) and space research service (SRS) (active) allocations in 9 500-9 800 MHz by as much as 200 MHz.

With regard to the radiolocation allocation upgrade, the tests and studies show compatibility between the radiolocation and radionavigation systems, leading to the conclusion that the RLS allocations can be upgraded to primary status with no impact on the radionavigation service (RNS). As a result of the studies, two methods to satisfy the agenda item are provided in the CPM text. In Method A1, the RLS is upgraded to primary status with the inclusion of regulatory text giving the RNS priority over the RLS. Method A2 upgrades the RLS allocation to primary without the additional regulatory text, thereby placing the RLS and RNS on equal status.

For the EESS (active) and SRS (active) extension, the CPM text provides two methods to satisfy the agenda item. Method B1, which is the preferred method according to Resolution **747 (WRC-03)**, proposes an allocation in 9 300-9 500 MHz band with regulatory text to protect the RNS and RLS and to limit the EESS (active) and SRS (active) allocations to wideband systems that could not be accommodated in the existing 300 MHz allocation. Since it is ultimately up to WRC-07 to decide on the suitability of EESS (active) and SRS (active) operations in 9 300-9 500 MHz, Method B2 is provided where the extension would be placed in 9 800-10 000 MHz. Presentation of the studies and inclusion of both methods provides the WRC-07 with maximum flexibility to make its decisions.

1/1.3/1 **Issue A –** Resolution **747 (WRC-03)** *resolves to invite ITU-R*

"1 to continue to study, as a matter of urgency, the technical characteristics, protection criteria, and other factors of radiolocation and radionavigation systems that ensure compatible operations in the bands 9 000-9 200 MHz and 9 300-9 500 MHz"

1/1.3/1.1 Background

There is a need to provide contiguous spectrum in the bands around 9 GHz for the RLS allocated on a primary basis worldwide, in order to provide adequate spectrum for new radar systems to function. Emerging requirements for increased image resolution and increased range accuracy necessitate wider contiguous emission bandwidths than are currently available. Therefore, there is a need to upgrade the status of frequency allocations to the RLS in the frequency range 9 000-9 200 MHz and 9 300-9 500 MHz in order for existing and planned radar systems to satisfy their required missions.

The bands 9 000-9 200 MHz and 9 300-9 500 MHz are allocated on a primary basis to the aeronautical radionavigation service (ARNS) and RNS, respectively. While radionavigation is recognized as a safety service as delineated in RR No. **4.10**, RLS systems have demonstrated compatible operations with RNS systems in the bands 9 000-9 200 MHz and 9 300-9 500 MHz over many years through the use of similar system characteristics such as low-duty cycle emissions and scanning beams as well as interference mitigation techniques.

Previous and ongoing studies within the ITU-R addressing other frequency bands indicate that sharing in the bands 9 000-9 200 MHz and 9 300-9 500 MHz between the RNS and the RLS is likely to be feasible. It should be noted that Recommendation ITU-R M.1313 contains the technical characteristics and protection criteria for maritime radars in the band 9 300-9 500 MHz and that Recommendation ITU-R M.1372 identifies interference reduction techniques which enhance compatibility among radar systems.

1/1.3/1.2 Summary of technical and operational studies and relevant ITU-R Recommendations and Reports

Recommendation ITU-R M.1372-1 provides information on the various mitigation techniques that radars use among themselves to prevent pulsed interference from degrading their operations. Many of the radars tested in the below mentioned reports and recommendations employ these types of techniques.

Draft new Recommendation ITU-R M.[8B.8-10 GHz] contains characteristics and protection criteria for radiodetermination systems operating in the band 8.5-10.5 GHz. The radiolocation waveforms that were used in the testing were developed from information contained in this Recommendation. The radionavigation systems that were tested are also representative of those in the Recommendation.

Report ITU-R M.2050 contains results of tests with marine radionavigation systems and pulsed interference.

Report ITU-R M.2076 – Factors that mitigate interference from radiolocation and EESS/SRS (active) radars to maritime and aeronautical radionavigation radars in the 9.0-9.2 and 9.3-9.5 GHz bands and between EESS/SRS (active) radars and radiolocation radars in the 9.3-9.5 and 9.8-10.0 GHz bands

Preliminary draft new Report ITU-R M.[Duty Cycle Tests] – Test results illustrating the effective duty cycle of frequency modulated pulsed radiolocation and EESS waveforms in a marine radionavigation receiver

Report ITU-R M.2081 – Test results illustrating compatibility between representative radionavigation systems and radiolocation and EESS systems in the band 8.5-10 GHz

While the aforementioned documents are considered to be sufficient to support conclusions to the Agenda item 1.3, it should be noted that protection criteria for radiodetermination systems need to be improved. In particular, the impact of radiolocation radars using duty cycles higher than those in draft new Recommendation ITU-R M.[8B.8-10 GHz] requires further study. There is currently no recommendation specifying the maximum acceptable duty cycle limit a radar receiver could be subject to without harmful operational disturbance.

1/1.3/1.3 Analysis of the results of studies

Recommendation ITU-R M.1461-1 states that the effect of pulsed interference is difficult to quantify and is strongly dependent on receivers/processor design and mode of operation. Testing is one manner to quantify the effect of interference. Reports ITU-R M.2050, ITU-R M.2081 and ITU-R M.2076 provide detailed information on the characteristics and interference mitigation techniques for radionavigation radars, EESS/SRS (active) systems, and radiolocation radars to mitigate interference. Preliminary draft new Report ITU-R M.[Duty Cycle Tests] presents test results showing how the effective duty cycle of FM pulsed signals is reduced as they pass through the receiver chain of marine radionavigation radars.

Testing was conducted to determine the ability of radionavigation radars to mitigate interference from radiolocation radars. Tests using a variety of radionavigation radars (maritime, precision approach radar, airborne weather, and airport surface detection equipment) showed a radar’s ability to suppress pulsed interference is closely related to duty cycle, pulse width of the interfering waveform, and to the bandwidth of the receiver. The test results showed typical radionavigation systems did not suffer any degradation in performance from interfering radiolocation waveforms at an I/N of +40 dB. In general, the pulse length and modulation characteristics of the potential interferer and the victim receiver are very different. The longer duty cycles of chirped waveforms are reduced to a value where the interference can be mitigated with interference mitigation circuitry (illustrated in Recommendation ITU-R M.1372). The test results show compatibility between the RNS and the RLS in the band 9 000-9 200 MHz and 9 300-9 500 MHz.

1/1.3/2 Issue B – Resolution **747 (WRC-03)** *resolves to invite ITU-R*

"2 to continue to study, as a matter of urgency, the technical characteristics, protection criteria and other factors of radiolocation, radionavigation, EESS (active) and space research services (active) systems that ensure compatible operations in the band 9 300-9 500 MHz"

1/1.3/2.1 Background

The band 9 500-9 800 MHz is allocated on a primary basis to the EESS (active), SRS (active), radiolocation and radionavigation services. In order to satisfy global environmental monitoring requirements for improved resolution, EESS (active) and the SRS (active) allocations require an increase of 200 MHz. This additional bandwidth will greatly improve the resolution of the features for global monitoring and for environmental and land-use purposes. Some administrations at the CPM07-2 were of the view that an increase of 200 MHz would not be sufficient to accommodate wideband systems with improved performance characteristics, for which the technology is now available. Studies have been performed that analyse the compatibility between EESS (active), and the existing services in the possible extension band 9 300-9 500 MHz.

1/1.3/2.2 Summary of technical and operational studies and relevant ITU-R Recommendations and Reports

Recommendation ITU-R RS.1166-3 – Performance and interference criteria for active spaceborne sensors

Recommendation ITU-R RS.1280 – Selection of active spaceborne sensor emission characteristics to mitigate the potential for interference to terrestrial radars operating in frequency bands 1-10 GHz

Report ITU-R RS.2094 – Studies related to the compatibility between EESS (active) and the radiodetermination service in the 9 300-9 500 MHz and 9 800-10 000 MHz bands and between EESS (active) and the fixed service in the 9 800-10 000 MHz band

Also refer to § 1/1.3/1.2.

1/1.3/2.3 Analysis of the results of studies

Recommendation ITU-R RS.1166-3 specifies the performance and interference criteria for spaceborne active sensors. Recommendation ITU-R RS.1280 provides a methodology for selecting active spaceborne sensor emission characteristics to help mitigate the potential for interference to terrestrial radars operating in frequency bands 1-10 GHz. Report ITU-R RS.2094 contains details on the pertinent compatibility studies and interference analyses performed over the 2003-2007 study cycle for the possible EESS (active) extension in the 9 GHz band under this agenda item.

When assessing the compatibility between radionavigation radars and systems operating in the EESS/SRS (active), tests and measurements along with analyses should be used for a more complete overview of the sharing potential. The test and analysis results show representative radionavigation and radiolocation radars do not suffer any degradation to their performance from representative EESS (active) waveforms at an *I*/*N* of +40 dB[1] for shipborne systems, *I*/*N* of +54 dB for airborne systems, *I*/*N* of +50 dB for ground-based systems, and an *I*/*N* of +28 dB for ground-based meteorological radars. Dynamic simulations show systems operating in 9 300-9 500 MHz may experience interference levels up to an *I*/*N* of +52 dB for shipborne systems, *I*/*N* of +45 dB for airborne systems, *I*/*N* of +23 dB for ground based systems, and an *I*/*N* of +27 dB for ground-based meteorological radars. It should be noted that these simulations show that narrow-band EESS (active) systems (i.e. below 300 MHz bandwidth) present higher interference potential than wideband EESS (active) systems. Dynamic simulations performed to determine the impact of radiodetermination systems on the EESS (active) show a global deployment of 1 000 radar systems would not exceed the EESS (active) interference criteria defined in Recommendation ITU-R RS.1166. Based on these results combined with the short durations of occurrence for the EESS (active) interference, compatibility between the EESS and radiodetermination systems operating in 9 300-9 500 MHz may be concluded. Further recognizing that narrow-band EESS (active) systems can already be deployed in the 9 500-9 800 MHz band, it can be concluded that the band 8 300-9 500 MHz can be allocated to the EESS (active) without any adverse impact on the radiodetermination service (RDS), provided that the EESS (active) allocation is limited to wideband systems (i.e. greater than 300 MHz) using the entire 9 300-9 800 MHz band.

Since the SRS (active) systems operate in the vicinity of planets and celestial bodies other than the Earth or as experimental platforms for future EESS (active) systems, SRS (active) systems were not studied for compatibility with any Earth-based systems. However, in this latter case, the SRS (active) system and the EESS (active) system would be essentially the same. With respect to other types of EESS (active) systems other than synthetic aperture radars (SAR), it should be noted that precipitation radars and cloud profile radars cannot operate in this frequency range due to the physics of their intended applications. Altimeters, which are wideband EESS (active) systems operating at relatively low power levels, have been shown to not cause interference to radiodetermination systems in the 9 500-9 800 MHz band. Results for any extension band should be analogous.

Dynamic simulations to determine the interference into a spaceborne SAR operating in the EESS (active) from systems operating in the RDS indicate that the aggregate interference from a distribution of radiodetermination systems does not exceed the SAR interference criteria. Furthermore, since the SAR interference criteria given in Recommendation ITU-R RS.1166 allows for an exceedance of up to 1% for systematic interference and up to 5% for random interference events, it can be concluded that the radiodetermination systems will not cause excessive interference to the EESS (active) systems.

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[1] An *I*/*N* of +40 dB was the highest level used in the tests. This value does not imply a level greater than +40 dB will degrade radar performance.

1/1.3/3 Issue C-1 – Resolution **747 (WRC-03)** *resolves to invite ITU-R*

"3 as a matter of urgency, with due regard to services to which these bands are allocated:

– to study the compatibility between radars of the radiolocation and radionavigation, services in the bands 9 000-9 200 MHz and 9 300-9 500 MHz through testing and measurements"

Refer to § 1/1.3/1 (including subsections).

1/1.3/4 Issue C-2 – Resolution **747 (WRC-03)** *resolves to invite ITU-R*

"3 as a matter of urgency, with due regard to services to which these bands are allocated:

– to continue to study and conduct the test measurements to determine the protection criteria for radionavigation and radiolocation systems in the bands 9 000-9 200 MHz and
9 300-9 500 MHz"

Refer to § 1/1.3/1 (including subsections).

1/1.3/5 Issue C-3 – Resolution **747 (WRC-03)** *resolves to invite ITU-R*

"3 as a matter of urgency, with due regard to services to which these bands are allocated:

– to study the compatibility between terrestrial radars of the radiolocation and radionavigation services, and spaceborne radars of the Earth exploration-satellite and space research services in the band 9 300-9 500 MHz"

Refer to § 1/1.3/2 (including subsections).

1/1.3/6 Issue D – Resolution **747 (WRC-03)** *resolves to invite ITU-R*

"4 in the event that sharing studies in the 9 300-9 500 MHz band lead to unsatisfactory conclusions which do not fully satisfy the requirement for an increase by up to 200 MHz of contiguous spectrum for EESS (active) and space research services (active), to carry out additional sharing studies in the alternative frequency range 9 800-10 000 MHz"

1/1.3/6.1 Background

The band 9 800-10 000 MHz is allocated to the RLS on a primary basis and to the fixed service (FS) on a secondary basis in all regions. RR No. **5.477** allocates the band 9 800-10 000 MHz on a primary basis to the FS for certain countries. As stated in Resolution **747 (WRC-03)**, the 9 800-10 000 MHz band was identified as an alternative to the 9 300-9 500 MHz band to obtain the 200 MHz bandwidth increase for EESS (active) and the SRS (active) needed to satisfy global environmental monitoring requirements for improved resolution. This additional bandwidth will greatly improve the resolution of the features for global monitoring and for environmental and land-use purposes. Some administrations at the CPM07-2 were of the view that an increase of 200 MHz would not be sufficient to accommodate wideband systems with improved performance characteristics, for which the technology is now available.

Due to the fact that studies have not definitively determined that compatibility exists in the 9 300-9 500 MHz band, additional ITU-R studies have been performed that analyse the compatibility between EESS (active) and the existing services in the possible extension band 9 800-10 000 MHz.

1/1.3/6.2 Summary of technical and operational studies and relevant ITU-R Recommendations and Reports

The studies summarized in § 1/1.3/2.2 to determine compatibility between EESS (active), SRS (active) and the RDS in the possible extension band 9 300-9 500 MHz also included an assessment of compatibility between EESS (active), SRS (active) and the RDS in the possible extension band of 9 800-10 000 MHz. To determine interference into the RDS, dynamic simulations were used to evaluate the *I*/*N* levels at a radar receiver input due to a spaceborne SAR operating co-channel in the 9 800 to 10 000 MHz band.

Studies to determine compatibility between the EESS (active), SRS (active) and the FS also employed dynamic simulations to determine interference statistics at FS receivers from a proposed spaceborne SAR transmitter, and interference statistics at a proposed spaceborne SAR receiver from FS transmitters. Simulation results indicated the following:

– Maximum interference levels into the spaceborne SAR were approximately 5.3 dB below the SAR interference criteria for both a world-wide random distribution of 1 536 point-to-point (P-P) FS stations, and 1 536 P-P FS stations distributed within the administrations listed in RR No. **5.477**.

– The worst case *I*/*N* levels at P-P FS receivers from a spaceborne SAR occurred when the FS antenna was pointed at a 5° elevation angle and a 0° or 180° azimuth angle relative to the SAR3 inclination angle. The *I*/*N* levels varied based on the FS station latitude with a worst case value of −53 dB exceeded 1% of the time for an FS station located at a 45° latitude.

1/1.3/6.3 Analysis of the results of studies

Compatibility between SARs that might operate in the EESS (active) and systems operating in the RDS in the band 9 800-10 000 MHz was assumed to be analogous to the compatibility between such systems in the 9 300-9 500 MHz band. While no specific measurements have been performed for systems in 9 800-10 000 MHz band, the waveforms and test results should be similar to those in the 9 300-9 500 MHz band. Therefore, when assessing the compatibility of radionavigation radars and systems operating in the EESS (active), tests and measurements along with analyses should be used for a more complete overview of the sharing potential (see § 1/1.3/2.3).

To determine levels of interference into the RDS, dynamic simulations were used to evaluate the *I*/*N* levels at a radar receiver input due to a spaceborne SAR operating co-channel in the 9 800 to 10 000 MHz band. Results of these simulations were similar to those in the 9 300-9 500 MHz band (see § 1/1.3/2.3).

As in the 9 300-9 500 MHz band, ITU-R studies have shown that the radiodetermination systems operating in the 9 800-10 000 MHz band will not cause excessive interference to the EESS (active) systems that may operate in this band.

The 9 800-10 000 MHz frequency band is more intensively used by some administrations for operating radiolocation systems as compared with the 9 300-9 500 MHz band. The characteristics of those radar systems operating in the 9 800-10 000 MHz frequency band somewhat differ from those in the 9 300-9 500 MHz frequency band. It is the view of these administrations that if characteristics of radars operating in the 9 800-10 000 MHz band differ from those (characteristics of radars in the 9 300-9 500 MHz band) used in the above simulations then different study results could have been obtained.

With respect to sharing between the EESS (active) and the FS, ITU-R studies have shown that interference from a distribution of FS transmitters operating in the 9 800-10 000 MHz band did not exceed the interference threshold of a spaceborne SAR. Furthermore, since the SAR interference criteria given in Recommendation ITU-R RS.1166 allows for an exceedance of up to 1% for systematic interference and up to 5% for random interference events, it can be concluded that the FS systems will not cause excessive interference to the EESS (active) systems. Preliminary ITU-R studies have examined the interference from EESS (active) systems into FS systems operating in the 9 800-10 000 MHz band and have determined that the worst-case interference from such systems does not exceed the long-term protection criteria of the FS for this band. The short-term protection criteria need to be evaluated with respect to these simulation results. Finally, these preliminary studies used the peak power of the SAR to evaluate the interference into the FS stations while it is more appropriate to use the average power of the SAR for such an evaluation.

Since the SRS (active) systems operate in the vicinity of planets and celestial bodies other than the Earth or as experimental platforms for future EESS (active) systems, SRS (active) systems were not studied for compatibility with any Earth-based systems. Another possible use of the SRS (active) is as an experimental platform for a future EESS (active) system. However, in this case, the SRS (active) system and the EESS (active) system would be essentially the same. With respect to other types of EESS (active) systems other than SARs, it should be noted that precipitation radars and cloud profile radars cannot operate in this frequency range due to the physics of their intended applications. Altimeters, which are wideband EESS (active) systems operating at relatively low power levels, have been shown to not cause interference to radiodetermination systems in the 9 500-9 800 MHz band. Results for any extension band should be analogous.

Some administrations at the CPM07-2 wished to inform the Conference about recent developments of active Earth exploration-satellite technology which indicates a requirement to use similar systems with a bandwidth up to 600 MHz in order to improve the resolution. Such a requirement could be met when the Conference would be prepared to provide a primary allocation to the EESS (active) and SRS (active) in the bands 9 300-9 500 MHz and 9 800-9 900 MHz, indicating that such an allocation be limited to systems that need a bandwidth wider than the bandwidth available within the existing allocation from 9 500-9 800 MHz or within the range 9 300-9 800 MHz.

Some administrations at the CPM07-2 expressed the view that the compatibility studies between the EESS (active) and SRS (active) and relevant other services, required to allow the Conference to decide on such an additional allocation, were not completed. However, at the CPM07-2 views were diverging, whether EESS (active) and SRS (active) systems requiring a bandwidth of 600 MHz had been sufficiently studied. Nevertheless, some administrations were of the opinion that the results for each of the extension bands indicate that those wideband systems may also be accommodated. Comparable studies have shown that wideband EESS/SRS (active) systems present lower interference potential than narrowband EESS/SRS (active) systems (i.e. below 300 MHz bandwidth). From the point of view of some administrations, there is a possibility to accommodate EESS (active) and SRS (active) systems with a bandwidth larger than 500 MHz. Thus significant service performance improvements by next generation systems in the EESS/SRS (active) could be achieved by enabling wideband systems with e.g. a 600 MHz bandwidth.

It was noted that the consideration of an additional allocation for EESS (active) and SRS (active), with a bandwidth larger than 200 MHz, is not covered by the text of Agenda item 1.3. However some administrations at the CPM07-2 think that an additional allocation for EESS (active) and SRS (active), with a bandwidth larger than 200 MHz would be in line with the intention of the agenda item. Notwithstanding such, some administrations are of the view that a CPM is not authorised to change and/or interpret the intention of agenda items, as such would cause a dangerous precedent for future CPMs.

Therefore the CPM07-2 considered it is not appropriate to specify any method describing an allocation scenario larger than 200 MHz, taking into account that it is to the Conference to decide whether it wishes to consider this.

1/1.3/7 Methods to satisfy the agenda item

1/1.3/7.1 *further resolves* 1 of Resolution 747 (WRC-03)

Method A1 – Upgrade the RLS to primary status in the bands 9 000-9 200 MHz and 9 300-9 500 MHz with addition of a new footnote (refer to § 1/1.3/8.1) to protect existing services and modification of RR No. **5.475**.

Advantages:

– Provides a primary allocation to the RLS, contiguous across 8.5-10.5 GHz, with sufficient bandwidth to meet emerging requirement for increased image resolution and increased range accuracy.

– Assures long-term operating and development environment for radiolocation systems.

– Provides an explicit requirement for protection of the RNS through continued priority of the RNS over RLS.

– Upgrading the RLS to co-primary status with a footnote meets the needs and radionavigation protection requirements specified by the maritime and aeronautical communities in the International Civil Aviation Organization and International Maritime Organization WRC-07 positions.

Disadvantages:

– Considering RR Nos. **5.28**, **5.29** and **5.30**, the RLS would be maintained to a secondary status in this band with respect to the RNS.

Method A2 – Upgrade the RLS to a primary allocation in the bands 9 000-9 200 MHz and 9 300-9 500 MHz.

Advantages:

– Provides a primary allocation to the RLS, contiguous across 8.5-10.5 GHz, with sufficient bandwidth to meet emerging requirement for increased image resolution and increased range accuracy.

– Assures long-term operating and development environment for radiolocation systems.

– Provide primary allocation to the RLS at frequencies in the vicinity of 9 GHz as needed to meet radar operational requirements while maintaining the status of the RNS.

– Is consistent with the fact that current RNS and RLS systems have been successfully operating for many years in the 9 GHz range, including the 9 300-9 500 MHz band.

– The coexistence of the RNS and RLS services exists in other bands such as 8 750-9 000 MHz, 9 200 to 9 300 MHz and 9 500-9 800 MHz without any footnote related to radiolocation.

Disadvantages:

– This approach could constrain the future operational use of radionavigation systems because the RNS will not have a formal priority over RLS designated by a footnote.

– The upgrade to co-primary without a footnote could preclude the deployment of certain types of navigation safety systems, particularly in the future.

1/1.3/7.2 *further resolves* 2 of Resolution 747 (WRC-03)

Method B1 – Provide a primary allocation to the EESS (active) and SRS (active) in the band 9 300-9 500 MHz, extending the current RR No. **5.476A** (refer to § 1/1.3/8.2) and indicating that this extension is limited to systems that need a bandwidth wider than the bandwidth available within the existing allocation from 9 500-9 800 MHz.

Advantages:

– Provides additional 200 MHz primary allocation for EESS (active) and SRS (active) in order to greatly improve the resolution of the features that would operate contiguously across 9 300 to 9 800 MHz for global monitoring and for environmental and land-use purposes.

– Assures long-term operating and development environment for EESS (active) and SRS (active) systems.

– Provides an explicit requirement for protection of the RNS and RLS.

– Avoid an extension of the allocation to narrow band EESS active systems (less than 300 MHz bandwidth) that may present higher interference potential against radiodetermination systems.

Disadvantages:

– By extending the frequency band covered by RR No. **5.476A**, EESS (active) may be potentially limited because it would have to protect the RNS and RLS.

Method B2 – Recognizing that Resolution **747 (WRC-03)** indicates that the option presented in this method is only to be considered if Method B1 is not fully satisfactory, this method provides a primary allocation to the EESS (active) and SRS (active) in the band 9 800-10 000 MHz with a modification to RR No. **5.476A** (refer to § 1/1.3/8.2).

Advantages:

– Provides a primary allocation to the EESS (active) and SRS (active), contiguous across 9 500 to 10 000 MHz, with sufficient bandwidth to meet emerging requirement for increased image resolution.

– Assures long-term operating and development environment for EESS (active) and SRS (active) systems.

– Provides a primary allocation to the EESS (active) and SRS (active), at frequencies in the vicinity of 9 GHz as needed to meet operational requirements while explicitly protecting the radionavigation service and radiolocation service.

– Avoids sharing with meteorological radars that operate in the 9 300-9 500 MHz band.

– Some administrations are of the view that the compatibility studies between EESS (active) systems and the radiolocation service systems have been completed because these studies took into account all systems whose characteristics were available within the ITU-R.

Disadvantages:

– It is not the primary focus of Resolution **747 (WRC-03)**.

– By extending the frequency band covered by RR No. **5.476A**, EESS (active) may be potentially limited because it would have to protect the RNS and RLS.

– In the band 9 975-10 000 MHz, the compatibility with the meteorological-satellite service (MetSat) allocated on a secondary basis by RR No. **5.479** was not studied. Hence, any EESS (active) allocation on a primary basis in this band would present a potential risk that may preclude the future use of this band by MetSat if compatibility is not effective.

– Since it is not known whether the characteristics of radionavigation systems that operate on a primary basis in seven administrations specified in RR No. **5.478** are contained in draft new Recommendation ITU-R M.[8B.8-10 GHz], compatibility with these systems has not been studied and therefore cannot be confirmed.

– Some administrations are of the opinion that the study on compatibility between the EESS (active) and radiolocation service is not comprehensive as it does not take into account the differences in technical characteristics and density of location of radiolocation stations operated in the 9 800-10 000 MHz band in comparison with the 9 300-9 500 MHz band.

1/1.3/8 Regulatory and procedural considerations

Where appropriate, changes to the Table of Frequency Allocations in RR Article **5** will be required, consistent with each method.

1/1.3/8.1 *further resolves* 1 of Resolution 747 (WRC-03)

Method A1 – An example of a possible new footnote for RR Article **5** suggested by Method A1 is given below:

ADD

5.RAD In the band 9 000-9 200 MHz, stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from, systems operating in the aeronautical radionavigation service. In the band 9 300-9 500 MHz, stations operating in the radiolocation service shall not cause harmful interference to, nor claim protection from, systems operating in the radionavigation service. In the band 9 300-9 500 MHz, ground-based radars used for meteorological purposes have priority over other radiolocation devices.

An example of possible modification to footnote RR No. **5.475** of Article **5** suggested by Method A1 is given below:

MOD

5.475 The use of the band 9 300-9 500 MHz by the aeronautical radionavigation service is limited to airborne weather radars and ground-based radars. In addition, ground-based radar beacons in the aeronautical radionavigation service are permitted in the band 9 300-9 320 MHz on condition that harmful interference is not caused to the maritime radionavigation service. ~~In the band 9 300-9 500 MHz, ground-based radars used for meteorological purposes have priority over other radiolocation devices.~~

1/1.3/8.2 *further resolves* 2 of Resolution 747 (WRC-03)

Method B1 – An example of a possible new footnote for RR Article **5** suggested by Method B1 is given below:

ADD

5.EESS The use of the band 9 300-9 500 MHz by Earth exploration-satellite service (active) and space research service (active) is limited to systems that cannot be accommodated within the 9 500-9 800 MHz band and that require bandwidths larger than 300 MHz.

An example of possible modification to footnote RR No. **5.476A** of Article **5** suggested by Method B1 is given below:

MOD

5.476A In the band 9 3~~5~~00-9 800 MHz, stations in the Earth exploration-satellite service (active) and space research service (active) shall not cause harmful interference to~~, or constrain the use and development of,~~ stations of the radionavigation and radiolocation services. (WRC-~~97~~07)

Method B2 – An example of possible modification to footnote RR No. **5.476A** of Article **5** suggested by Method B2 is given below:

MOD

5.476A In the band 9 500-~~9 8~~10 000 MHz, stations in the Earth exploration-satellite service (active) and space research service (active) shall not cause harmful interference to~~, or constrain the use and development of,~~ stations of the radionavigation and radiolocation services. (WRC-~~97~~07)

ADD

5.FS In the band 9 800-10 000 MHz, stations in the Earth exploration-satellite service (active) and space research service (active) shall not claim protection from, nor cause harmful interference to, stations of the fixed service operating under RR No. **5.477**.

Agenda item 1.4

"to consider frequency-related matters for the future development of IMT-2000 and systems beyond IMT-2000 taking into account the results of ITU-R studies in accordance with Resolution 228 (Rev.WRC-03)"

Resolution 228 (Rev.WRC-03) – Studies on frequency-related matters for the future development of IMT-2000 and systems beyond IMT-2000 as defined by ITU-R

Executive summary

A new name of "IMT-Advanced" for those systems, system components, and related aspects that include new radio interface(s) that support the new capabilities of systems beyond IMT-2000, has been proposed as detailed in the draft Resolution ITU-R [IMT.NAME] that will be considered for approval at the 2007 Radiocommunication Assembly. This draft Resolution clarifies that the term "IMT-2000" includes the future development of IMT-2000 and that "IMT" comprises both IMT-2000 and IMT-Advanced.

Section 1/1.4/1.3/1 describes the results of Report ITU-R M.2079 and indicates that the candidate bands should focus on bands between 400 MHz and 5 GHz. Radio interfaces that would be specific for nomadic applications may also be accommodated in the bands above 5 GHz allocated to the MS at WRC-03, if such use is in accordance with RR No. **5.446A** and Resolution **229 (WRC-03)**, and in other bands above 5 GHz. Therefore, an additional identification in the 5 GHz band specifically to IMT in the RR may not be necessary.

In addition to bands already identified for IMT-2000, the following bands, some of which may need a primary allocation to the mobile service, are being considered as candidate bands for the terrestrial component of IMT-2000 and IMT-Advanced: 410-430 MHz, 450-470 MHz, 470-806/862 MHz, 2.3-2.4 GHz, 2.7-2.9 GHz, 3.4-4.2 GHz and 4.4-4.99 GHz. In all of these bands, administrations have implemented various systems and services, as listed in Report ITU-R M.2079, so that these bands are not currently available for the worldwide or Regional deployment of IMT-2000 and IMT-Advanced. A summary of advantages and disadvantages is included in § 1/1.4/5.

With regard to the satellite component of IMT-2000 and IMT-Advanced, studies have been undertaken to assess the spectrum requirements for the period 2010 to 2020 and have identified a requirement for additional spectrum. Candidate frequency bands for the satellite component have been proposed for identification in the ranges 1 518-1 525 MHz and 1 668-1 675 MHz, recognizing the difficulties of using the 1 668-1 675 MHz for such purpose (see Resolutions **670 (WRC-03)** and **744 (WRC-03)**). However, these bands would not fully meet the predicted spectrum requirements as established in Report ITU-R M.2077.

There are four methods to satisfy the agenda item for the terrestrial component and one method for the satellite component of IMT, which can be found in § 1/1.4/6 and the regulatory and procedural considerations can be found in § 1/1.4/7.

1/1.4/1 Issue A – Resolution **228 (Rev.WRC-03)** *resolves* 2

"to invite ITU-R to report, in time for WRC-07, on the results of studies on the spectrum requirements and potential frequency ranges suitable for the future development of IMT-2000 and systems beyond IMT-2000, taking into account:

– the evolving user needs, including the growth in demand for IMT-2000 services;

– the evolution of IMT-2000 and pre-IMT-2000 systems through advances in technology;

– the bands currently identified for IMT-2000;

– the time-frame in which spectrum would be needed;

– the period for migration from existing to future systems;

– the extensive use of frequencies below those identified for IMT-2000 in No. **5.317A**."

1/1.4/1.1 Background

In Recommendation ITU-R M.1645, a new radio access interface(s) is envisaged to handle a wide range of supported data rates according to economic and service demands in multi-user environments with peak data rates, as targets for research, of up to approximately 100 Mbit/s for high mobility applications such as mobile access and up to approximately 1 Gbit/s for low mobility applications such as nomadic/local wireless access. Since this Recommendation indicates the systems "will be developed around the year 2010", and "could be widely deployed around 2015 in some countries" or as required to meet user needs, ITU-R has already initiated its work on standardization of IMT-Advanced radio interface(s).

In RR Nos. **5.317A**, **5.384A** and **5.388**, WARC-92 and WRC-2000 together with Resolutions **212 (Rev.WRC-97)**, **223 (WRC-2000)** and **224 (WRC-2000)** identified bands for the terrestrial component of IMT-2000, recognizing that administrations have the flexibility to use the bands for other applications of services to which the bands are allocated and to implement IMT-2000 in other mobile bands.

Since 2000, IMT-2000 systems have been deployed in the bands identified at WARC-92 and WRC-2000. As of the end of 2005, more than 10% of the world's 2 billion terrestrial mobile subscribers had already moved to IMT-2000 systems and this figure is growing rapidly.

Regarding the satellite component, the number of users of mobile-satellite service (MSS) systems overall (including non-IMT-2000 systems) has continued to grow, based on voice and data telecommunications with data rates of up to 492 kbit/s, with at least one system providing services using one of the satellite radio interfaces for the satellite component of IMT-2000. Furthermore, aimed at addressing the mobile applications, including convergence between services, there are new approaches emerging for satellite systems, such as distribution of multimedia content services and integrated MSS-and-terrestrial networks.

Looking further to the future, improvements in satellite technology are expected which will result in the increase of the overall spectrum efficiency. However, to fulfil the framework for the satellite component of IMT, it is envisaged that further spectrum is needed in addition to that identified at WARC-92 and WRC-2000. As demonstrated by the ITU-R, operation in separate frequency bands should continue to be the rule in bands currently identified for the satellite and terrestrial components of IMT-2000.

As a consequence, standalone mobile satellite systems will always exist. In addition, integrated[2] MSS-and-terrestrial systems in some or parts of the bands identified for the satellite component of IMT-2000 can offer continuous service provision over a wide area using one or more space stations integrated with terrestrial infrastructure. This provides the ability to improve the availability of communications services in areas where communications with one or more space stations cannot be ensured, and to improve spectrum reusability. With regard to ITU-R matters, it should be noted that no ITU-R studies have yet been performed to ensure the compatibility of integrated MSS-and-terrestrial systems with existing services. Nevertheless, in some countries in Regions 1 and 2, some studies were undertaken and initiatives are underway to allow for the deployment of integrated MSS-and-terrestrial systems in certain MSS bands[3]. Footnote RR No. **5.351A**, with its reference to Resolution **225 (Rev.WRC-03)**, identifies certain bands as being available for the satellite component of IMT-2000. Some of the bands, or parts thereof, identified for the satellite component of IMT-2000 given in *resolves* 1 and *considering a)* of Resolution **225 (Rev.WRC-03)** could be used by integrated MSS-and-terrestrial systems with appropriate authorization and any necessary technical and operational constraints.

The bands 1 518-1 525 MHz and 1 668-1 675 MHz were allocated to the MSS at WRC-03, with a number of regulatory constraints or provisions relating to sharing with other services allocated in the same bands. *Resolves* 4 of Resolution **225 (Rev.WRC-03)** indicates that a future competent conference may consider adding the bands 1 518-1 525 MHz and 1 668-1 675 MHz to the frequency bands indicated in *resolves* 1 (bands for the satellite component of IMT-2000).

1/1.4/1.2 Summary of technical and operational studies, and relevant ITU-R Recommendations and Reports

Recommendations ITU-R M.818-2, ITU-R M.1391-1, ITU-R M.1645, ITU-R M.1768, ITU-R M.1167, and draft revised Recommendation ITU-R M.1036-2; Reports ITU-R M.2072, ITU-R M.2074, ITU-R M.2077, ITU-R M.2078 and ITU-R M.2079.

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[2] The term “integrated” as used in this section means that the terrestrial component of the system is an integral part of the mobile-satellite system, is controlled by the satellite resource and network management system and uses the same portions of the frequency band as the associated MSS space system.

[3] For example, some Region 1 and 2 administrations have implemented or are considering implementing domestic rules to allow the deployment and operation of integrated MSS-and-terrestrial systems in some or parts of the bands identified for the satellite component of IMT-2000 given in *resolves* 1 and *considering a)* of Resolution **225 (Rev.WRC-03)**.

Globally identified frequency bands will encourage the adoption of IMT by facilitating global roaming and reducing equipment cost through economies of scale. This is a preferred objective. It would also be preferable for the new frequency bands that support the wide area mobility capability of IMT-Advanced to be reasonably close to the bands already identified for IMT-2000 facilitating the re-use of this spectrum. Furthermore, for suitable spectrum for new applications, especially if a wide bandwidth or paired spectrum is needed, it is desirable to identify the spectrum at an early stage so that it can be made available for use in a timely manner.

Enhancements in radio technology are enabling operators to increase their capacity within their assigned spectrum. This could allow operators to evolve their existing IMT-2000 systems to IMT-Advanced by using their existing frequencies to provide some services expected to be provided by IMT-Advanced.

ITU-R has considered the possible implications to the current sharing and coordination conditions that may arise if the bands 1 518-1 525 MHz and 1 668-1 675 MHz were to be used for the satellite component of IMT-2000. It may be noted that the band 1 668-1 675 MHz is also being considered under WRC-07 Agenda item 1.7 and those studies have also considered the possibility for the band to be used by MSS systems. The existing regulatory constraints and provisions in the bands 1 518-1 525 MHz and 1 668-1 675 MHz preclude the operation of MSS in most of North America. However, it should not preclude the potential designation for other ITU Regions and parts of Regions.

1/1.4/1.3 Analysis of the results of studies

1/1.4/1.3.1 Terrestrial component

As indicated in Recommendation ITU-R M.1645 the majority of the future traffic is changing from speech-oriented communications to multimedia packet communications. Therefore, in Report ITU-R M.2078, the methodology on terrestrial spectrum requirement estimation for IMT has been enriched by taking into consideration the new user demand requirements and network deployment.

As indicated by Report ITU-R M.2078, the predicted total spectrum bandwidth requirement for both existing mobile cellular systems, including pre-IMT-2000 and IMT-2000 and its enhancements, and IMT-Advanced for the year 2020 was calculated for both low and high user-demand scenarios to be 1 280 MHz and 1 720 MHz, respectively. It should be noted that this lower figure (1 280 MHz) is higher than the requirements for some countries. In addition, there are some countries where the requirement is larger than the higher value (1 720 MHz). The spectrum prediction is based on an assumption of one network deployment. In case of several parallel network deployments in a country, spectrum requirements will be higher as provided by Report ITU-R M.2078.

On the one hand, some administrations are of the view that identification based on the lower user-needs setting would provide the greatest opportunity for global harmonization. On the other hand, some other administrations are of the view that the spectrum identification should be based on higher user-needs setting for two reasons: to avoid national or regional bands used for IMT, which would lead to potential difficulty in frequency arrangement and consequentially lose the merits of globally harmonized spectrum; to allow maximum flexibility and commonality as administrations wishing to implement IMT based on the low user-needs setting scenario, could do so within a part of the identified spectrum bands for higher user-needs setting and also benefit from global economies of scale.

The spectrum estimate for the nomadic application within IMT-Advanced is already included in the total spectrum estimate. Although the spectrum estimation tool used by the ITU-R does not separately estimate the spectrum for nomadic applications of IMT-Advanced, some administrations are of the view that the unadjusted spectrum assigned by the tool for pico and hot spot cells should be used to estimate the amount of spectrum needed for nomadic applications within IMT-Advanced, and that this amount is around 50% of the net additional spectrum estimate. However some other administrations do not support this assessment because ITU-R studies did not reach any conclusion concerning the amount of spectrum for nomadic applications within IMT-Advanced.

Some administrations are of the view that the spectrum requirements for IMT-Advanced mobile and nomadic applications should be satisfied from the candidate bands addressed in this report. Some other administrations are of the view that the spectrum requirements for IMT-Advanced nomadic applications can be satisfied from the candidate bands addressed in this Report and also in bands above 5 GHz.

Report ITU-R M.2078 does not address the specific spectrum requirements for large coverage areas with low teledensity. Administrations may therefore determine that the spectrum separately required for large coverage areas with low teledensity may be less than amounts indicated in Report ITU-R M.2078.

Table 1.4-1 shows the net additional spectrum requirement per ITU Region, beyond that identified for IMT-2000 at both WARC-92 and WRC-2000, taking into account that different amounts of spectrum have been identified for IMT-2000 in each Region.

TABLE 1.4-1

Predicted spectrum requirements by the year 2020 for IMT

		Region 1		**Region 2**		**Region 3**	
User demand setting	**Predicted total (MHz)**	**Identified (MHz)**	**Net additional (MHz)**	**Identified (MHz)**	**Net additional (MHz)**	**Identified (MHz)**	**Net additional (MHz)**
Low	1 280	693	587	723	557	749	531
High	1 720	693	1 027	723	997	749	971

NOTE – Prediction based on one network deployment.

It is noted that the identified bandwidth in Table 1.4-1 includes spectrum identified for the satellite component of IMT-2000, according to Resolution **223 (WRC-2000)** (60 MHz) and Resolution **225 (Rev.WRC-03)** (40 MHz), which may or may not be implemented in various ITU Regions.

The timely availability of adequate spectrum is critical to support future services. The priorities in the selection of the additional spectrum include: worldwide frequency bands to enable universal access, global roaming and economies of scale; sharing and regulatory constraints for bands currently in use by other services and the particular needs of developing countries and countries with large areas of low population density to support extended and cost effective coverage of mobile services. As presented in the table above, the total spectrum bandwidth requirement is predicted for the year 2020. Some administrations may not require additional spectrum prior to a particular date between 2010 and 2020.

Technical constraints of future spectrum availability are primarily based on requirements and target characteristics for IMT-Advanced. The high bit-rate requirements suggest that considerably wider bandwidths than what is available today may be needed, requiring additional spectrum. Thus spectrum ranges allowing only relatively narrow bandwidth should not be the first choice for the new IMT-Advanced capabilities. Moreover, it is desirable to identify sufficiently wide blocks of spectrum since this should result in the efficient use of spectrum. This is because fragmented band usage requires more guardbands and leads to the lack of scalability of channel bandwidth and complicates spectrum arrangements for IMT.

In this process, due account should be taken of the services to which the frequency bands are currently allocated. Further information is available in Report ITU-R M.2079. Report ITU-R M.2079 indicates that the prioritized candidate bands should focus on bands between 400 MHz and 5 GHz. Radio interfaces that would be specific for nomadic applications may also be accommodated in the bands above 5 GHz allocated to the MS at WRC-03, if such use is in accordance with RR No. **5.446A** and Resolution **229 (WRC-03)**, and in other bands above 5 GHz. Therefore, an additional identification in the 5 GHz band specifically to IMT in the RR may not be necessary.

1/1.4/1.3.2 Satellite component

With regard to the spectrum requirements of the satellite component of IMT-2000 and systems beyond IMT-2000, the studies are contained in Report ITU-R M.2077. The studies considered a range of assumptions and conclude that over the period 2010 to 2020, the additional required spectrum in the range 1-6 GHz would be according to the figures provided in Table 1.4-2, noting that only 2 x 86 MHz is globally available for MSS.

TABLE 1.4-2

Predicted spectrum requirements for the satellite component of IMT

Estimated required spectrum (MHz)	Lower estimate		Upper estimate	
	2010	2020	2010	2020
Required new allocations in Earth-space direction		19		90
Required new allocations in space-Earth direction excluding distribution		54	3	137
Required new allocations in space-Earth direction including distribution	14	144	33	257

The main reason for the imbalance between Earth-to-space and space-to-Earth directions are distribution applications (see Recommendation ITU-R M.818-2), and asymmetric multimedia services showing higher spectrum requirements on space-to-Earth links. Further details can be found in Report ITU-R M.2077.

In accordance with *resolves* 6 of Resolution **228 (Rev.WRC-03)**, WRC-07 could consider the possible inclusion of an agenda item for WRC-11 for additional MSS allocations in the range 1-6 GHz in line with the above identified spectrum requirements for the time-frame 2010-2020, which could be addressed under Agenda item 7.2.

With regard to the possible identification of the bands 1 518-1 525 MHz and 1 668-1 675 MHz for the satellite component of IMT-2000, there is no need to modify the current coordination provisions in the RR. In addition, the availability of those bands for IMT-2000 satellite services would provide operators and administrations with an unambiguous and consistent regulatory situation, as these bands are adjacent or close to existing bands which are already identified for the satellite component of IMT-2000, with one system currently providing satellite IMT-2000 services.

1/1.4/2 Issue B – Resolution 228 (Rev.WRC-03) *resolves* 3

"to invite ITU-R to conduct regulatory and technical studies on the usage of frequencies below those identified for IMT-2000 in No. **5.317A** for the future development of IMT-2000 and systems beyond IMT-2000, notably assessing their advantages and disadvantages, taking into account *recognizing e)* and *j)* above"

1/1.4/2.1 Background

In line with Resolution **228 (Rev.WRC-03)**, ITU-R considered the regulatory and technical issues of using bands below 806 MHz (862 MHz for Region 1) for IMT.

Given the favourable propagation characteristics of lower frequency bands and the associated coverage advantages, there may be significant cost effectiveness in lower band deployment for large areas with low user density or where there is no existing infrastructure. This is particularly important for developing countries and those with low teledensity and additional information can be found in ITU-D Question 18/2 – Strategy for migration of mobile networks to IMT-2000 and beyond Mid-Term Guidelines (MTG) on the smooth transition of existing mobile networks to

IMT-2000 for developing countries, the ITU-R Migration to IMT-2000 Systems – Supplement 1 to the Handbook on Deployment of IMT-2000 Systems and Resolution **224 (WRC-2000)**. Some administrations have already taken advantage of these benefits afforded by the use of bands below those already identified for IMT-2000.

1/1.4/2.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

For a complete list of relevant reference documents, see § 1/1.4/1.2.

Recommendation ITU-R M.1645 stated that geographical coverage could be increased for the terrestrial component of IMT by using lower frequency ranges than those today identified for IMT-2000 or by using the satellite component of IMT-2000, subject to market conditions and certain limitations, such as handset size, power consumption and indoor coverage. The Recommendation also states that IMT services can best be provided at low cost to rural areas and to low income populations by using globally harmonized frequencies to minimize terminal complexity and maximize economies of scale in order to minimize system cost. Bands below the identified spectrum defined in RR No. **5.317A** will allow an increase in geographical coverage. Further information can be found in Report ITU-R M.2079.

1/1.4/2.3 Analysis of the results of studies

The selection of bands should take into consideration the ability to support extended and cost-effective coverage of mobile services in developing countries and countries with large areas of low population density by using frequency bands below those already identified for IMT-2000.

A study undertaken demonstrated that, when the capital and operational expenses of operating a network are measured, the use of the lower frequency band is a more cost effective solution than the use of the higher bands. However, the study noted that no single solution will be the most cost-effective solution in every instance.

1/1.4/3 Issue C – Resolution 228 (Rev.WRC-03) *resolves* 4

"that the studies referred to in *resolves* 1 and 2 should take into consideration the particular needs of developing countries including use of the satellite component of IMT-2000 for suitable coverage of these countries"

1/1.4/3.1 Background

The mobile penetration in developing countries is increasing dramatically and already exceeds that of fixed-line penetration in many developing countries.

IMT technologies including the terrestrial and satellite components can help developing countries achieve universal service through the introduction of multimedia services like telemedicine, tele-education, and high speed internet access in rural schools. These services could increase the level of information distribution throughout society and therefore contribute to socio-economic progress on the whole including industrial development.

Developing countries, in particular those with large geographic areas, would be optimally served by satellite and/or terrestrial IMT-2000 systems. The choice between terrestrial and satellite systems needs to consider certain conditions, including available bands, cost-effective coverage, physical and economic reasons.

1/1.4/3.2 Summary of technical and operational studies and relevant ITU-R Recommendations

Recommendations ITU-R M.819-2 and ITU-R M.1645 (see also § 1/1.4/2.2 and 1/1.4/2.3).

To meet the particular needs of developing countries, Recommendation ITU-R M.819-2 addresses the deployment of IMT-2000 systems that can be used for the provision of services to fixed users. Recommendation ITU-R M.1645 addresses the possibility of providing IMT-2000 services at low cost to rural areas and to low-income populations and increase geographical coverage through the terrestrial and satellite components of IMT by using to the extent possible globally harmonized frequencies to minimize terminal complexity and maximize economies of scale in order to minimize system cost.

1/1.4/3.3 Analysis of the results of studies

Satellite and terrestrial solutions are complementary and developing countries can select the most appropriate solutions. In developed countries, there are also large geographic areas which may warrant the deployment of satellite networks for economic reasons. In addition, many developing and developed countries are in areas prone to natural disasters such as earthquakes and hurricanes which can severely disrupt terrestrial communications. Hence, for all of the above reasons, satellite solutions can be particularly attractive for both developing and developed countries.

1/1.4/4 **Issue D –** Resolution **228 (Rev.WRC-03)** *resolves* 5

"that the studies referred to in *resolves* 1, 2 and 3 should include sharing and compatibility studies with services already having allocations in potential spectrum for the future development of IMT-2000 and systems beyond IMT-2000 taking into account the needs of other services"

1/1.4/4.1 Background

The selection process for possible candidate bands of IMT must consider compatibility, coordination and sharing with other primary services. To aid this process, the sharing studies between IMT and other applications and services, such as DVB, radar, and the FSS, were conducted.

In all bands that are candidates for IMT-2000 and IMT-Advanced, administrations have implemented various systems and services. Report ITU-R M.2079 includes information about current allocations, current and intended band usage, as well as results of sharing studies so far available for candidate bands for IMT-2000 and IMT-Advanced.

1/1.4/4.2 Summary of technical and operational studies and relevant ITU-R Recommendations and Reports

The status of sharing studies prepared in accordance with Resolution **228 (Rev.WRC-03)** and relevant to the candidate bands is summarized below. It should be noted that the sharing studies in the candidate bands are performed based on:

– the current and planned band usage, which could evolve during the period while IMT is being further developed and implemented;

– the assumptions on the future characteristics of IMT-Advanced which would be standardized after WRC-07.

Bands below 1 GHz

For space applications and meteorology, Annex 1 of Recommendation ITU-R SA.1236 contains one approach to evaluate protection for fixed and mobile services while for remote sensing systems Annex 2 of Recommendation ITU-R RS.1260-1 provides information on the feasibility of sharing between active spaceborne sensors and other services in the range of 420-470 MHz (this Recommendation replaces Recommendation ITU-R SA.1260-1).

Concerning the broadcasting service (BS), sharing studies are currently being progressed initially from an IMT perspective to investigate sharing between IMT-2000 and systems beyond IMT-2000 applications and digital television broadcasting applications in the band 470-862 MHz.

Results of sharing studies presented to date based on low and medium power broadcasting transmitters show feasibilities for coexistence between IMT and broadcasting systems including Digital Video Broadcasting – Terrestrial (DVB-T), Digital Video Broadcasting – Handheld (DVB-H) and Advanced Television Systems Committee (ATSC) with band segmentation, which may require frequency rearrangement also taking into account geographical separations. The feasibility is subject to a number of assumptions and limitations. The feasibility of sharing between IMT and high power broadcasting transmitters has not yet been fully studied.

Sharing studies between BS in the 470-480 MHz band and the IMT systems in the MS in the 450-470 MHz are being progressed within ITU-R. Preliminary results indicate that sharing between IMT and broadcasting systems in adjacent bands is feasible with the use of mitigation techniques.

Sharing studies between radars in the radiolocation service (RLS) in the 420-450 MHz band and IMT systems in the 450-470 MHz are being progressed within the ITU-R. Preliminary results indicate that sharing between systems in the 440-450 MHz band is feasible only with mitigation. Application of mitigation techniques to IMT systems and radars is currently being studied to reduce the separation distances for sharing between IMT systems and radiolocation radars.

Finally, sharing studies between systems in the fixed service (FS) and non-IMT systems in the MS and IMT systems in the 450-470 MHz band are being progressed within the ITU-R. Preliminary results indicate that co-channel sharing between fixed or non-IMT systems in the MS and IMT systems is problematic in most instances. Adoption of mitigation techniques between the IMT systems in the MS and systems in the FS or non-IMT systems in the MS may be required to enable sharing between the two types of systems.

Bands between 2 000 and 3 400 MHz

Recommendation ITU-R M.1461-1 provides guidance for determining the potential for interference between radars operating in the radiodetermination service (RDS) and systems in other services while Recommendation ITU-R M.1464-1 contains the characteristics of the radiolocation radars, and characteristics and protection criteria for sharing studies for aeronautical radionavigation and meteorological radars in the radiodetermination service operating in the frequency band 2 700-2 900 MHz. Report ITU-R M.2039 provides IMT-2000 parameters and interference criteria.

A significant percentage of ARNS and meteorological radars that are deployed throughout the 2 700-2 900 MHz band are close to cities and/or airports. These radars perform operations critical to safety-of-life and protection of life and property. In many regions IMT deployment within the band could impose serious constraints on radar operations and future radar deployments.

Sharing studies are currently being progressed within the ITU-R to investigate sharing between the aeronautical radionavigation service (ARNS) and meteorological radars and IMT-2000 and beyond IMT-2000 systems in the 2 700-2 900 MHz band. Although information has been exchanged so far between the relevant working parties, it should be noted that the meeting schedule does not permit these ongoing studies to be coordinated with the relevant working party on radars.

Studies thus far show that interference between incumbent radars operating in the band 2 700-2 900 MHz and IMT systems will occur to ARNS and meteorological radars on a co-channel basis. Separation distances of greater than 100 km between the radar and the nearest macro, micro, and pico IMT networks are necessary in order to protect radar operations.

Some administrations are of the view that the results of ongoing studies where mitigation techniques are taken into account would result in significantly lower separation distances to protect radars from IMT interference.

Some other administrations are of the view that the studies do not contain technical analyses to substantiate the claims that mitigation techniques may reduce separation distances. Such separation distances would imply the need to consider coordination, including cross border with neighbouring countries, which makes effective implementation difficult.

Analysis of interference from radars into IMT networks shows that interference will be present even with radars at distances of hundreds of kilometres from IMT networks.

Some administrations are of the view that ongoing studies thus far indicate that this interference would not seriously affect quality of service due to the radar’s pulse characteristics and the error-correcting features of the IMT devices.

Some other administrations are of the view that ongoing studies do not currently contain a level of technical analyses to substantiate the claim that pulsed interference may not seriously affect IMT quality of service.

In order to identify the band 2 700-2 900 MHz for IMT systems, a primary allocation needs to be made to the mobile service. No sharing studies between ARNS radars, meteorological radars and other systems belonging to the mobile service have been conducted.

Bands between 3 400 and 5 000 MHz

It should be noted that some administrations are conducting redeployment of existing services in the bands 3 400-4 200 and 4 400-4 990 MHz in order to enable the introduction of mobile services.

Results of sharing studies between IMT and radar systems

Recommendation ITU-R M.1465 contains the representative technical and operational characteristics of the radiolocation radars in the frequency band 3 100-3 700 MHz. Sharing studies are being progressed within the ITU-R between IMT-2000 and systems beyond IMT-2000 applications and the RLS in the band 3 400-3 700 MHz and may be completed prior to WRC-07.

Preliminary studies between airborne radar operating under a primary allocation (RR No. **5.433**) and IMT have shown that:

– The required separation distance is approximately 360 km in some cases where combined co-channel and adjacent channel analysis is conducted for the sharing between IMT and airborne radar systems.

– Using non-overlapping adjacent channel analysis only, the required separation distance is approximately 0 km, depending on the radar type and antenna type. Some administrations are of the view that no frequency separation is required between the radar and IMT channels, and some other administrations are of the view that up to 70 MHz between the radar and IMT carrier frequencies is required.

Preliminary studies between shipborne radar operating under a primary allocation (RR No. **5.433**) and IMT have shown that:

– The required separation distance is approximately 45 km in some cases where combined co-channel and adjacent channel analysis is conducted for the sharing between IMT and shipborne radar systems.

– Using non-overlapping adjacent channel analysis only, the required separation distance is less than 1 km, depending on the radar type and antenna type. Some administrations are of the view that no frequency separation is required between the radar and IMT channels, and some other administrations are of the view that up to 70 MHz between the radar and IMT carrier frequencies is required.

It is noted that for both airborne and shipborne scenarios, if appropriate interference mitigation measures are implemented at the IMT system, the required separation distances can be reduced. Finally, it should also be noted that many areas to be observed by these radars are those over oceans or at high altitudes; however, in some cases the areas observed are in close proximity to land-based facilities in ports and other coastal regions. Densely populated land areas where IMT traffic demand is high seldom coincide with the target of the observation areas of these radars, however, in some countries, these radars are used in populated areas where IMT systems may operate.

Taking into account the number of radars and their deployed locations as well as the future envisaged deployed area for IMT-Advanced systems, geographical segregation and mitigation techniques facilitate the sharing between IMT-Advanced and radar systems.

Results of sharing studies between IMT and FSS

Sharing studies have been performed related to the possibility of IMT-2000 and beyond systems to be deployed in the band utilized by the FSS in the bands 3 400-4 200 MHz and 4 500-4 800 MHz. The use of the band 3 400-4 200 MHz by FSS also includes governmental uses and international commitments within the WMO, which are essential for civil aviation and weather, water, climate and environmental alerts and which are currently using only a few channels, mainly in the 3 600-3 800 MHz band.

Satellite networks are notified with the ITU and frequency assignments are recorded in the Master International Frequency Register (MIFR) at the ITU. Each administration can decide which earth stations it wishes to be protected within its own territory, whether they are notified to the ITU or not. The satellite network notification includes the associated earth stations in the "Typical" category, so that the earth station can be deployed anywhere in the implemented service area. This should be taken into account in sharing studies.

To provide protection of the FSS receive earth stations, some physical separation to the stations of the mobile terrestrial network is required. The magnitude of this separation distance depends on the parameters of the networks and the deployment of the two services. The magnitudes of these required distances to protect the FSS receive earth stations have been studied, taking account of the need to meet both short-term and long-term interference criteria requirements.

The minimum required separation distances from IMT base stations, when using the long-term interference criteria derived in the studies to date, are at least in the tens of kilometres.

The minimum separation distances associated with short-term interference criteria would be expected to be higher with similar assumptions as the ones used for the long-term. The application of the terrain data model associated to the short-term interference criteria is being studied by ITU-R at the time of preparation of this report. The results of the studies will be included in an ITU-R Report which is expected to be finalized prior to WRC-07.

In order for WRC-07 to identify this band for IMT systems, a primary allocation in the band or some parts of the band 3.4-4.2 GHz may need to be made to the mobile service. IMT base stations will have to coordinate with FSS earth stations located in other countries using RR Appendix **7**.

Although the studies have differences in assumptions and methodologies and need to be continued to find convergence, they all show that sharing between IMT-Advanced stations and an FSS earth station is not feasible within the area delineated by the minimum required separation distances for each azimuth to protect that specific FSS earth station. Therefore, sharing is feasible only when the receiving earth station is at a specified location and under the condition that the minimum required separation distance together with the criteria mutually agreed between the concerned administrations are observed. If FSS is deployed in a ubiquitous manner and/or with no individual licensing of earth stations, sharing is not feasible in the same geographical area since no minimum separation can be guaranteed.

The effect of use of terrain information, including clutter losses, on the reduction of the separation distance has been studied. Studies have also shown that the use of local terrain information, including clutter losses, will reduce the separation distance. The degree of this reduction will depend on the specific circumstances. However, the reliability of local terrain information has not been proven for all countries.

Site shielding for FSS earth stations, where possible, would mitigate interference from IMT-Advanced systems. Other mitigation techniques for IMT-Advanced systems, such as narrow-beam transmission based on sectorized- or adaptive-beamforming antenna, sector disabling and antenna down-tilting will reduce the required minimum separation distance where they are effective. Some of these mitigation techniques could increase the deployment density of IMT base stations in a given area. The impact of this increase in the number of IMT cells should be taken into consideration when computing the aggregate interference.

The deployment scenarios of FSS earth stations and IMT systems may be taken into account to take the full advantage of the mitigation techniques.

According to the studies conducted so far, the effectiveness of the above-mentioned mitigation techniques is dependent on their application to individual site situations and can be applied only when the specific location of the FSS earth stations are known. Further studies are necessary to determine the circumstances which would permit the effective use of such techniques.

With respect to interference from FSS into IMT-Advanced, studies have provided a range of results, from interference criteria not being exceeded up to interference criteria being exceeded by 5 dB, depending on the assumptions (particularly the type of IMT-Advanced base station considered and the FSS space station e.i.r.p. density). Further studies are required, before WRC-07, to confirm these results by using agreed assumptions.

Results of sharing studies between IMT and FS

With respect to coexistence between ubiquitously deployed IMT-Advanced and the ubiquitously deployed FS, it has been suggested that it will be unlikely that both services could be deployed within the same geographic area in the same country in co-channel cases. However, deployment of IMT-Advanced in one country and FS in a neighbouring country can be foreseen.

1/1.4/4.3 Analysis of the results of studies

The result of the sharing/compatibility studies should be taken into account in determining the suitability of each candidate band for IMT.

1/1.4/5 Candidate bands for the future development of IMT-2000 and systems beyond IMT-2000

Administrations have conducted regulatory and technical studies on the usage of frequencies for IMT and have articulated their views on the advantages and disadvantages of the various candidate bands being considered for IMT at WRC-07.

In all bands that are candidates for IMT-2000 and IMT-Advanced, administrations have implemented various systems and services, as listed in Report ITU-R M.2079, so that these bands are not currently available for the worldwide or regional deployment of IMT-2000 and IMT-Advanced, therefore it should be noted that there was no consensus on the candidature or suitability of any of these bands as prospects for identification for IMT. When selecting candidate bands for IMT it should be noted that the planned usage of the new bands by IMT-Advanced is subject to user demands and in some countries it is foreseen to be widely deployed around 2015.

The following paragraphs provide information on the advantages and disadvantages of the various candidate bands being considered for the future development of IMT-2000 and IMT-Advanced. For each band listed below or portions thereof, some administrations have indicated that they are considering it for IMT, while some other administrations have indicated that they use the band for other services and do not intend to deploy IMT.

Some of these bands have a primary allocation to the MS, while some bands have only a secondary allocation to the MS, and some bands have no allocation to the MS. See RR Article **5** and § 1/1.4/7.

410-430 MHz and 450-470 MHz advantages

These bands have better propagation characteristics in comparison to higher frequency bands with significant coverage and economic benefits.

Some administrations believe these bands are important especially for some developing countries and countries with large areas where economic solutions for low population density areas are necessary.

In some countries, IMT-2000 networks have already been deployed in the band 450-470 MHz and equipment is commercially available in this band.

410-430 MHz and 450-470 MHz disadvantages

The limited bandwidth may limit the capacity of the IMT networks.

Some administrations are of the view that these bands would not be an economic solution for IMT.

The bands are heavily used in many countries by other land mobile services including public protection and disaster relief particularly in densely populated areas, however, some of these applications may possibly be provided by IMT systems in certain areas and certain cases.

The wavelength in these bands may impact the antenna size of the terminal and base station.

470-806/862 MHz advantages

This band has better propagation characteristics in comparison to higher frequency bands with significant coverage and economic benefits.

Some administrations believe this band is important especially for some developing countries and countries with large areas where economic solutions for low population density areas are necessary.

The upper part of the band is close to other bands identified for IMT-2000 (i.e. 806-960 MHz). This may lead to reduced complexity of equipment. The lower part, 470-600 MHz, has even better propagation characteristics.

Introduction of digital broadcasting may allow flexibility for the future consideration of other services and applications, including mobile broadcast and IMT, in portions of this band after the analogue TV switch-off.

Using the same frequency band as the BS simplifies the integration of the two services in a terminal using the same antenna.

470-806/862 MHz disadvantages

This band is predominantly used by the BS. At RRC-06, a regional plan for digital terrestrial broadcasting has been established for Region 1 and one country in Region 3. The agreement contains a dynamic process for modification and addition to the plan and its implementation. This regional plan and its evolution need to be protected. In some countries, portions of the band are also used for other services and applications (i.e. radio astronomy, aeronautical radionavigation, public protection and disaster relief, and applications ancillary to broadcasting).

Some administrations are of the view that this band would not be an economic solution for IMT.

In order to avoid poor terminal antenna performance, it is necessary to identify harmonized sub-bands for IMT. It may be difficult to define a harmonized channelling arrangement and, in Region 1, it should be congruent to the GE-06 Agreement (RRC-06), which is being implemented.

Coexistence of cellular stations with high power/high site broadcast stations may result in adjacent channel interference and thus additional constraints. Also, a guardband may be needed between mobile broadcast and IMT uplink services for converged terminal.

The wavelength in the lower portion of this band may impact the antenna size of the terminal and base station.

2 300-2 400 MHz advantages

This band is near the bands already identified for IMT-2000 and would present similar propagation characteristics. This could be beneficial for reducing the complexity of the equipment. In some countries IMT-2000 networks have already been or are being deployed in this band.

2 300-2 400 MHz disadvantages

Some administrations are of the view that when considering the IMT-Advanced spectrum requirement and characteristics this band may offer insufficient bandwidth.

Some administrations are using the frequency band 2 300-2 400 MHz for other applications (e.g. aeronautical telemetry, sound broadcasting satellite, non-mobile wireless broadband services).

2 700-2 900 MHz advantages

This band is near the bands already identified for IMT-2000, which may facilitate the use of the same antenna as in the bands around 2.5 GHz and would present similar propagation conditions.

Ongoing studies indicate that certain mitigation techniques could reduce the separation distance between radars and IMT networks.

2 700-2 900 MHz disadvantages

The band is allocated on a primary basis and used for aeronautical radionavigation, a safety of life service, in all three ITU-R Regions. The band is also used for ground-based meteorological radars under RR No. **5.423**. Both cases require special measures to ensure their freedom from harmful interference. See RR No. **4.10**.

Studies thus far show that interference between incumbent radars operating in the band 2 700-2 900 MHz and IMT-2000 systems will occur to ARNS and meteorological radars on a co-channel basis. Agreement has not been reached on the effectiveness of interference mitigation techniques on reducing the level of this interference.

In some administrations and geographical areas, there are numerous radar systems established in this band.

3 400-4 200 MHz advantages

The size of the band would accommodate IMT-Advanced systems which are envisaged with large bandwidth and would provide significant capacity.

The use of this band may facilitate the convergence between cellular and broadband wireless access systems already deployed in the lower part of this band in some countries

In some administrations, FS and FSS are not deployed in the sub-band 3.4-3.6 GHz.

Smaller antenna size for terminals and base stations, which is favorable feature to implement multiple-antenna techniques enabling high spectrum efficiency

3 400-4 200 MHz disadvantages

In all regions the band 3 400 to 4 200 MHz is used by stations in the fixed and fixed satellite services. There is extensive deployment of FSS earth stations (including VSAT-type) in the band 3 625-4 200 MHz in all ITU Regions, and in 3 400-3 625 MHz in ITU Regions 1 (except parts of Europe) and 3 (except a few countries of Asia) and it constantly develops. This band is important for FSS because atmospheric absorption is lower in this frequency band, thus improving reliability and coverage, particularly in case of severe rain fade conditions. Many developing countries rely heavily on satellite links in this band to provide vital domestic and international connectivity, and are likely to continue to do so for the foreseeable future.

The band 3 400-3 800 MHz is widely used in some countries for fixed and mobile broadband wireless access systems.

Some administrations are using the sub-band 3 400-3 600 MHz for radiolocation.

4 400-4 990 MHz advantages

The size of the band would accommodate IMT-Advanced systems which are envisaged with large bandwidth and would provide significant capacity.

Smaller antenna size for terminals and base stations, which is favorable feature to implement multiple-antenna techniques enabling high spectrum efficiency.

4 400-4 990 MHz disadvantages

The band 4 500-4 800 MHz is covered by the provisions of RR Appendix **30B** (the FSS plan) and is therefore intended to preserve orbit/spectrum resources for future use, on an equitable basis among all country members of the ITU, and in particular for developing countries.

The plan is important for inter-governmental systems such as the Regional African Satellite Communications Organization (RASCOM) involving more than 50 African countries using and intending to implement satellite systems in the frequency band 4.5-4.8 GHz of RR Appendix **30B** as well as the band 3 700-4 200 MHz for their infrastructure telecommunication systems.

This band 4 500-4 800 MHz is important for FSS providing basic infrastructure telecommunication system because atmospheric absorption is lower in this frequency band and enables high degree of reliability and wide coverage, particularly in geographical areas with severe rain fade conditions.

WRC-07 will review RR Appendix **30B** (Agenda item 1.10) which is a very complex matter. In particular, it will consider the requirement of more than 25 countries which do not have any allotment in the plan due to the fact that their geographical situations is different from that prevailing when the plan was established and it will address the issue of coordination between the receiving earth stations and terrestrial services. Therefore it is not possible to reliably decide on the matter until the outcome of WRC-07 is known.

The band has the largest frequency-dependent propagation loss in comparison with other candidate bands, adversely affecting the possibility of high mobility mobile applications.

Some administrations are using this band for government services including aeronautical mobile or for fixed services for long distance links. Portions of this band are also used by some administrations for radio astronomy.

1/1.4/6 Methods to satisfy the agenda item

1/1.4/6.1 Methods to satisfy the terrestrial component of IMT

The RR allocate frequencies to radiocommunication services. RR Nos. **5.317A**, **5.384A**, and **5.388** identify spectrum for IMT-2000. This identification relates in practice to a specific set of technologies as described in Recommendation ITU-R M.1457-5.

The methods described hereafter are concepts and may be applied to all or some of the candidate frequency bands or a part of these bands.

Method 1: On the basis that IMT is the root name for both IMT-2000 and IMT-Advanced and the technologies associated with those terms, IMT could also be used as the application name in the Radio Regulation footnotes. The additional IMT spectrum could come from spectrum with a primary mobile allocation in RR Article **5** or a new primary allocation to mobile. A footnote would be used to identify the specific spectrum bands for IMT.

Method 1A: Existing IMT-2000 spectrum could be identified generically for IMT, and any additional spectrum could be identified generically for IMT in the RR.

Method 1B: Existing IMT-2000 footnotes in the RR would not change and any additional spectrum could be identified generically for IMT in the RR.

Advantages of both Methods 1A and 1B:

– In additional spectrum that is made available, the most up-to-date technology could be selected independently from whether it is IMT-2000 or IMT-Advanced.
– A wider choice of mobile technologies and associated range of potential bands would be identified, leading to greater flexibility.
– IMT-2000 systems in additional spectrum would not be limited in their evolution.

Advantages of Method 1A:

– IMT-2000 systems would not be limited in their evolution and have the opportunity to evolve to IMT-Advanced systems within the bands that are used for IMT-2000.
– Reusing existing infrastructure and spectrum assignments will reduce the cost of implementing new technologies and increase spectrum efficiency.
– IMT-Advanced systems would be recognized more explicitly also as candidates for deployment in the bands presently identified as available for IMT-2000.
– Would not artificially segment spectrum between IMT-2000 and IMT-Advanced, allowing greater flexibility in the choice of mobile technologies.
– Allows operators the opportunity to expand or evolve their existing systems to offer some services of IMT-Advanced systems within the bands that they are using for IMT-2000.

Disadvantage of Method 1A:

– Changing the identification of bands in which IMT-2000 is currently deployed may have a negative impact on the ongoing IMT-2000 network development.

Advantages of Method 1B:

– Avoids creating uncertainty for the bands already identified for IMT-2000 by maintaining the current identification.

Disadvantages of Method 1B:

– Creates distinctions between IMT-2000 and IMT-Advanced spectrum.

– May create regulatory impediments for the evolution of IMT-2000 systems and the deployment of IMT-Advanced systems.

– May result in a larger amount of spectrum being requested since previously identified spectrum for IMT-2000 may not be used for the new capabilities.

– May prevent IMT-Advanced systems from gaining access to current IMT-2000 bands and the propagation characteristics of these bands.

Method 2: Any additional spectrum could be identified specifically for IMT-Advanced, or specifically for IMT-2000 (this term includes the future development of IMT-2000), or for both IMT-Advanced and IMT-2000. Any additional spectrum for IMT-Advanced and for the future development of IMT-2000 could come from spectrum with a primary mobile allocation in RR Article **5** or a new primary allocation to mobile. A footnote would be used to identify the specific spectrum bands for IMT-Advanced and/or for IMT-2000 as appropriate, and existing IMT-2000 footnotes in the RR would not change.

Advantages:

– Avoids creating uncertainty for the bands already identified for IMT-2000 by maintaining the current identification.

– Facilitates the long term planning of spectrum usage.

Disadvantages:

– Creates distinctions between IMT-2000 and IMT-Advanced spectrum.

– May create regulatory impediments for the evolution of IMT-2000 systems and the deployment of IMT-Advanced systems in additional spectrum unless the identification is made for both IMT-2000 and IMT-Advanced in the same spectrum.

– May result in a larger amount of spectrum being requested since previously identified spectrum for IMT-2000 may not be used for the new capabilities unless the identification is made for both IMT-2000 and IMT-Advanced.

– May prevent IMT-Advanced systems from gaining access to current IMT-2000 bands and the propagation characteristics of these bands.

Method 3: No specific identification of additional spectrum within RR Article **5** for IMT, but any additional spectrum could come from spectrum with a primary mobile allocation in RR Article **5** or a new primary allocation to mobile. A WRC Resolution or Recommendation may be prepared to provide the principles and conditions on the use of the frequency bands suitable for IMT. The Resolution or Recommendation would also broadly address frequency ranges associated with IMT. The status of existing IMT-2000 footnotes would need to be addressed.

Advantages:

– For additional spectrum and possibly for existing IMT-2000 spectrum, supports flexibility to deploy the most suitable mobile technology in any band allocated for the MS with no designated technology.

Disadvantages:

– If the frequency ranges are only broadly addressed, the absence of harmonization will impact the global spectrum arrangements and roaming.

– May negatively impact the standardization process, interoperability of various technologies and subsequent diminishment of economies of scale.

– May create distinctions (different status) between existing IMT-2000 identifications and additional identifications.

Method 4: No change to the RR. This method could be applied on a band-by-band basis to all or parts of any of the candidate frequency bands.

Advantages:

– This is consistent with *recognizing i)* of Resolution **228 (Rev.WRC-03)** stating that some bands may not be appropriate for identification on a global basis because of the extent of use of these bands by existing services.

Disadvantages:

– If this method does not allow identifying sufficient spectrum for IMT, this would impede the future development of IMT-2000 and IMT-Advanced systems.

1/1.4/6.2 Method to satisfy the satellite component of IMT

With regard to the satellite component of IMT-2000 and IMT-Advanced, WRC-07 may consider identifying the bands 1 518-1 525 and 1 668-1 675 MHz as bands which may be used by administrations wishing to implement the satellite component. This could be accomplished by adding the bands to RR No. **5.351A** and modification to Resolution **225 (Rev.WRC-03)**.

Advantages:

– Would partially increase the spectrum available for MSS systems which are part of the satellite component of IMT-2000 and IMT-Advanced.

– Would provide consistent regulatory provisions in the 1-3 GHz range, which would apply to MSS systems wishing to provide IMT-2000 services in the bands 1 518-1 525 MHz and 1 668-1 675 MHz in conjunction with services in other nearby MSS bands.

Disadvantages:

– These bands are not available for MSS use globally. However, this fact would be unchanged with the identification of the bands for the satellite component of IMT-2000.

1/1.4/7 Regulatory and procedural considerations

With regard to the terrestrial component of IMT, new regulatory provisions including the modification of the Table of Frequency Allocations in RR Article **5** will be needed for frequency bands not already allocated to the mobile service on a primary basis, in order to allocate them to the mobile service on a primary basis. In addition to bands already identified for IMT-2000, the following bands, some of which may need a primary allocation to the mobile service, are being considered as candidate bands for the terrestrial component of IMT-2000 and IMT-Advanced: 410-430 MHz, 450-470 MHz, 470-806/862 MHz, 2.3-2.4 GHz, 2.7-2.9 GHz, 3.4-4.2 GHz and 4.4-4.99 GHz. Administrations should refer to RR Article **5** for complete allocation information on each of the candidate bands.

Example for Method 1A

MOD

5.317A Administrations wishing to implement International Mobile Telecommunications~~-2000~~ (IMT~~-2000~~) may use those parts of the band 806-960 MHz which are allocated to the mobile service on a primary basis and are used or planned to be used for mobile systems (see Resolution **224 (WRC-2000)**). This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-~~2000~~07)

SUP

5.388

MOD

5.384A The bands, or portions of the bands, 1 710-1 885 MHz and 1 885-2 025 MHz and 2 110-2 200 MHz and 2 500-2 690 MHz [and aa-bb, and cc-dd MHz], are identified for use by administrations wishing to implement International Mobile Telecommunications~~-2000~~ (IMT~~-2000~~) in accordance with [MOD Resolution **223 (WRC-2000)** or a new Resolution]. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. (WRC-~~2000~~07)

Example for Method 1B

ADD

5.IMT The bands aa – bb, cc – dd, ee – ff, gg – hh … MHz are identified for use by administrations wishing to implement IMT systems within the framework of International Mobile Telecommunications (IMT) in accordance with [MOD Resolution **223 (WRC-2000)** or a new Resolution]. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations.

NOC

5.317A, 5.384A, 5.388

Example for Method 2

ADD

5.IMT The bands aa – bb, cc – dd … MHz are identified for use by administrations wishing to implement [IMT-2000][IMT-Advanced][IMT-2000 and IMT-Advanced] systems within the framework of International Mobile Telecommunications (IMT) in accordance with [MOD **Resolution 223 (WRC-2000)** or a new Resolution]. This identification does not preclude the use of these bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations.

NOC

5.317A, 5.384A, 5.388

Example for Method 3

For the band aa – bb MHz where no primary mobile allocation exists, a new primary allocation to mobile service would be required in the table of frequency allocations. In Method 3, according to the treatment of the existing footnotes, the suppression or modification of the relevant footnote may be required. A WRC Resolution or Recommendation may be prepared to provide the principles and conditions on the use of the frequency bands suitable for IMT.

Agenda item 1.5

"to consider spectrum requirements and possible additional spectrum allocations for aeronautical telecommand and high bit-rate aeronautical telemetry, in accordance with Resolution 230 (WRC-03)"

Resolution 230 (WRC-03) – Consideration of mobile allocations for wideband aeronautical telemetry and associated telecommand

invites ITU-R

"to conduct, as a matter of urgency, studies to facilitate sharing between aeronautical mobile telemetry and the associated telecommand, on the one hand, and existing services, on the other hand, taking into account the *resolves* (1-4)"

Executive summary

With the increasing complexity of aircraft design and pressure to shorten timescales for the development of new aircraft there is an increasing demand for access to spectrum for the provision of aeronautical telemetry and telecommand systems. WRC-07 Agenda item 1.5 seeks to identify spectrum that can be used to meet this demand. Studies carried out in ITU have shown the need for access to an additional 650 MHz of spectrum for aeronautical telemetry for flight testing to meet the predicted demand. A requirement of 700 MHz for other wideband aeronautical telemetry was identified but it was assessed that this can be met in current allocations. It is assessed that current allocations are enough for telecommand to support testing of aircraft.

Whilst the agenda item asks for the identification of spectrum in the band 3-30 GHz, studies have been limited to spectrum below 16 GHz due to the availability of current technology. The bands above 16 GHz could be considered in the future provided that technology becomes available. Furthermore, existing secondary mobile allocations between 3 and 16 GHz were considered but not found suitable for upgrading to primary status for use by aeronautical mobile telemetry.

Flight testing studies carried out in ITU-R have identified five candidate bands. The candidate bands studied are 4 400-4 940 MHz, 5 030-5 091 MHz, 5 091-5 150 MHz, 5 150-5 250 MHz and 5 925-6 700 MHz. Each band has its advantages and disadvantages and opinions vary as to which bands are appropriate and required.

One method is provided for Issue A and three methods with additional variants are provided for Issue C appropriate to the bands 5 030-5 091 MHz, 5 091-5 150 MHz and 5 150-5 250 MHz. It is concluded that no methods are required for Issues B and D.

1/1.5/1 **Issue A –** Resolution **230 (WRC-03)** *resolves* that WRC-07 be invited to

"1 consider the spectrum required to satisfy justified wideband aeronautical mobile telemetry requirements and associated telecommand above 3 GHz"

1/1.5/1.1 Background

This agenda item addresses the rapidly growing demand for aeronautical flight test telemetry spectrum. There is a large and growing shortfall in spectrum that is necessary to conduct aeronautical telemetry. The shortfall is due to rapidly increasing telemetry data rates associated with the testing of new technologies. The shortfall is exacerbated by the loss of telemetry spectrum diverted to other than telemetry applications.

Question ITU-R 231/8 also indicates that new or growing applications for test and non-test telemetry applications require access to appropriate spectrum for their operation. Without access to additional spectrum, aeronautical development would be subject to escalating delays and costs, and the impairment of global competitiveness of the aerospace industry. Worldwide recognition of spectrum for aeronautical mobile telemetry (AMT) will facilitate equipment commonality and give manufacturers and operators of flight test ranges a measure of additional certainty for the substantial investment in AMT infrastructure.

1/1.5/1.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

Existing relevant ITU-R Recommendations: ITU-R F.384, ITU-R F.758-4, ITU-R F.1108, ITU-R F.1245, ITU-R F.1336-1, ITU-R F.1494, ITU-R M.1459, ITU-R P.452-12, ITU-R RA.769-2, ITU-R S.465-5, ITU-R S.524-7, ITU-R S.1328, ITU-R S.1432, ITU-R SA.509, ITU-R SF.1006, ITU-R SF.1320, ITU-R SF.1650, ITU-R M.1739.

New relevant ITU-R Recommendations and Reports: DN Recommendation ITU-R M.[8/167], PDN Report ITU-R M.[AMT 4/6 GHz], PDN Report ITU-R M.[AMS-FSS], PDN Recommendation ITU-R M.[AMT 5 030-5 250 MHz].

1/1.5/1.2.1 Spectrum required to support testing of aircraft

ITU-R studies have been completed to define the amount of spectrum needed to support testing of aircraft.

Sharing studies have been undertaken between AMT and FSS (4 500-4 800 and 5 925-6 700 MHz), RAS (4 825-4 835 MHz), and FS/MS (4 400-4 940 and 5 925-6 700 MHz).

1/1.5/1.2.2 Spectrum required to support other wideband aeronautical mobile telemetry and associated telecommand

ITU-R studies have been completed to define the amount of spectrum short term needed to support other wideband aeronautical mobile telemetry and associated telecommand than for flight testing.

1/1.5/1.3 Analysis of the results of studies

4 500-4 800 MHz between AMT aircraft stations and FSS: Under the assumptions of the studies conducted, coordination distances between AMT aircraft stations and FSS receiving earth stations can be quite large irrespective of the location of the earth stations (e.g. approximately 450 km) since they are based on hypothetical worst-case operating conditions. However, separation distances calculated using more typical technical parameters and operating conditions could be smaller (e.g. 106-528 km). Studies show that interference into AMT aircraft stations from FSS space stations would be acceptable.

4 500-4 800 MHz FSS downlink into AMT ground station: The results indicate that a satellite operating in accordance with the RR Appendix **30B** Plan could cause significant interference (i.e. 4 dB to 15 dB I_0/N_0) into an AMT ground station at certain pointing angles – mostly above 30° elevation. However, given the fact that most telemetry stations operate at elevation angles below 20° the vast majority of the time and antenna sizes will typically be in the 2-3 m range, FSS interference in these cases is less than –3 dB (I_0/N_0).

5 925-6 700 MHz AMT to FSS (uplink): The analyses show that the peak aggregate signal power from AMT transmitters increases the receiver noise power by no more than 0.1 dB ($\Delta T_s/T_s = 2.7\%$) in FSS space stations and by no more than 0.2 dB ($\Delta T_s/T_s = 4.9\%$) in more sensitive, hypothetical FSS space stations (assumed to have a relatively high uniform G/T of +7 dB/K over the satellite coverage area).

4 825-4 835 MHz AMT to the radioastronomy service (RAS): Studies of AMT sharing with the radio astronomy service at 4 825-4 835 MHz show that, operation of AMT aircraft transmitters within 500 km of a radio astronomy observatory should be subject to careful frequency planning and may require mitigation techniques.

4 400-4 940 and 5 925-6 700 MHz AMT into FS/MS: The interfering signals will be below permissible, co-channel levels with lateral distance separation (measured orthogonal to the FS main-beam axis) of 12 km. A 450 km separation distance is needed in co-channel sharing situations involving worst-case antenna coupling (main beam to main beam), which can occur at certain combinations of aircraft altitude and separation distances. Frequency sharing could be facilitated by appropriately limiting the regions of AMT operations and by choosing operating frequencies that could avoid co-channel interference due to operations within each region.

4 400-4 940 and 5 925-6 700 MHz FS/MS into AMT: For the 4 400-4 940 MHz band, maximum separation distances are 150-425 km. These distances are needed in situations where the AMT ground station and FS transmitter antennas are oriented towards each other. However, typical separation distances (which occur when neither antenna is pointed at the other) are of the order of 10-20 km. Over a large range of azimuths, the separation is only 1-2 km. For the 5 925-6 700 MHz band, these results are lower in each category.

1/1.5/1.3.1 Spectrum required to support testing of aircraft

Some studies in the ITU-R have determined the need for an additional 105 MHz of AMT spectrum whilst other studies in the ITU-R have determined this need to be at least 650 MHz. Telecommand functions, which require relatively little spectrum, do not require any additional allocations. Due to technical constraints, spectrum for AMT use must be below 7 GHz.

4 500-4 800 MHz between AMT aircraft stations and FSS: Under the assumptions of the studies conducted, coordination distances between AMT aircraft stations and FSS receiving earth stations can be quite large irrespective of the location of the earth stations (e.g. approximately 450 km) since they are based on hypothetical worst-case operating conditions. However, separation distances calculated using more typical technical parameters and operating conditions could be smaller (e.g. 106-528 km). Studies show that interference into AMT aircraft stations from FSS space stations would be acceptable.

1/1.5/1.3.2 Spectrum required to support other wideband aeronautical mobile telemetry and associated telecommand

1/1.5/1.3.2.1 Short term aeronautical telemetry and associated telecommand spectrum requirements

The worldwide spectrum of 700 MHz will be necessary for the operations other than flight testing (e.g. unmanned airborne vehicle payload) used for many kinds of civilian purposes in an international context.

Worldwide spectrum requirement is already available among some of the current mobile allocations between 3 and 16 GHz.

1/1.5/1.3.2.2 Medium and long terms aeronautical telemetry and associated telecommand spectrum requirements

The need for the mid and long terms is not yet defined.

1/1.5/2 Issue B – Resolution **230 (WRC-03)** *resolves* that WRC-07 be invited to

"2 review, with a view to upgrading to primary, secondary allocations to the mobile service in the frequency range 3-16 GHz for the implementation of wideband aeronautical telemetry and associated telecommand"

Existing secondary mobile allocations between 3 and 16 GHz were considered but not found suitable for upgrading to primary status for use by aeronautical mobile telemetry.

1/1.5/3 Issue C – Resolution **230 (WRC-03)** *resolves* that WRC-07 be invited to

"3 consider possible additional allocations to the mobile service, including aeronautical mobile, on a primary basis in the frequency range 3-16 GHz for the implementation of wideband aeronautical telemetry and associated telecommand, taking into account *considering d)*"

1/1.5/3.1 Background

Taking into account the spectrum requirements identified under Issue A, ITU-R investigated the possibilities for new allocations satisfying the needs for AMT.

1/1.5/3.2 Summary of technical and operational studies and relevant ITU-R Recommendations

1/1.5/3.2.1 Additional allocations for aeronautical mobile telemetry for testing of aircraft between 3 and 16 GHz

Sharing studies have been undertaken in the band 5 030-5 250 MHz with the following current allocations ARNS (5 030-5 150 MHz), FSS (Earth-to-space feeder links) (5 091-5 250 MHz), MS except aeronautical (5 150-5 250 MHz).

Studies with AMS(R)S (5 030-5 150 MHz), FSS (space to Earth feeder links) (5 150-5 216 MHz), RDSS (space-to-Earth feeder links) (5 150-5 216 MHz), ARNS (5 150-5 250 MHz), have not been undertaken within the ITU-R as no technical parameters of systems using the bands have been provided.

Studies have also been undertaken with the AM(R)S limited to surface airport application which is proposed to be allocated in all or portions of the band 5 000-5 150 MHz at WRC-07 under Agenda item 1.6. Allocation to AMS for security applications (AS) in the band 5 091-5 150 MHz at WRC-07 is also considered under Agenda item 1.6, however studies are not yet completed.

1/1.5/3.2.2 Additional allocations for use by other wideband aeronautical mobile telemetry and associated telecommand spectrum requirements between 3 and 16 GHz

As indicated in § 1/1.5/1.3.2 the current regulatory framework shows that this 700 MHz worldwide spectrum requirement may be satisfied within the current MS allocations between 3 and 16 GHz.

1/1.5/3.3 Analysis of the results of studies

1/1.5/3.3.1 Additional allocations for aeronautical mobile telemetry for testing of aircraft between 3 and 16 GHz

Studies with ARNS indicate that there would be a requirement for large distance separation between the AMT transmitters and the microwave landing system (MLS) ground station when co-frequency. However, for adjacent MLS channels frequency separation should reduce that distance. Therefore the possibility for AMT to share with ARNS is dependant on the population and distribution of ARNS ground stations. Further studies are on-going which need to be completed prior to WRC-07.

Despite the results of the technical analysis, operational aspects need also to be considered. In ICAO's view, allocations to the aeronautical services should be made generally for all Radio Regulation Regions and normally on a basis exclusive for safety services. These principles reflect the global process of standardization within ICAO for the promotion of safety and to support the global interoperability of radiocommunication and radionavigation equipment used in civil aircraft.

Sufficient frequency offset is required to achieve compatibility between ARNS/MLS and AMT in the same geographical area, and this may more easily be achieved by using the frequency band 5 091-5 150 MHz.

Studies with FSS and AMS for AMT concluded that 3% $\Delta T_s/T_s$[4] would be available for the aggregate interference caused by AMS (AM(R)S and AMS/AS for Agenda item 1.6 plus AMS/AMT for Agenda item 1.5) in the band 5 091-5 150 MHz. In the band 5 091-5 150 MHz it was shown that for an operational scenario with 21 co-frequency aircraft operating simultaneously in a single FSS receiver ground footprint the interference from AMT into the FSS receiver is below a $\Delta T_s/T_s$ of 1%.

In the band 5 150-5 250 MHz, studies with FSS and AMS for AMT concluded that (3–x)% $\Delta T_s/T_s$ would be available for the aggregate interference caused by AMS, where x is the percentage (if any) contributed by applications in the ARNS plus any applications other than MS wireless access systems (WAS) and the proposed AMT application. This portion of the interference excludes that due to MS (WAS) which are allowed 3%. In this band it was shown that for one operational scenario with 21 co-frequency aircraft operating simultaneously in a single FSS receiver ground footprint, the interference from AMT into the FSS receiver is below a $\Delta T_s/T_s$ of 1%. The difference in the interference environment, i.e., MS (WAS), in the 5 150-5 250 MHz band compared to the 5 091-5 150 MHz band, must be recognized in the apportionment of interference among the potential services sharing with the FSS.

Studies with MS (WAS) and AMT in the frequency band 5 150-5 250 MHz have confirmed the need for an *I/N* value of –6 dB for the protection of MS (WAS). The MS (WAS) characteristics that need to be taken into account and hence the maximum pfd limit of an AMT transmitter has yet to be agreed.

Studies with AM(R)S and AMT in the frequency band 5 030-5 150 MHz have confirmed the need for an *I/N* value of –6 dB for the protection of a new airport surface radio local area network (RLAN), based on the IEEE standard 802.16e in Annex 3 to DN Recommendation ITU-R M.[8/167]. The AM(R)S characteristics that need to be taken into account in these studies and hence the maximum pfd limit of an AMT transmitter in the view of an airport surface radio local area network has yet to be agreed.

1/1.5/3.3.2 Additional allocations for other wideband aeronautical mobile telemetry and associated telecommand spectrum requirements between 3 and 16 GHz

There is no need for additional allocations to the mobile service, including aeronautical mobile, on a primary basis in the frequency range 3-16 GHz to support other wideband aeronautical mobile telemetry and associated telecommand short term spectrum requirements than those for flight testing.

[4] The increase (ΔT_s) in the satellite noise temperature (T_s).

1/1.5/4 Issue D – Resolution **230 (WRC-03)** *resolves* that WRC-07 be invited to

"4 designate existing mobile allocations between 16 and 30 GHz for wideband aeronautical telemetry and associated telecommand"

It was decided not to proceed with such studies during this study cycle due to the fact that AMT technologies do not yet enable practical use of these bands. These bands could be considered in the future provided that technology becomes available.

1/1.5/5 Methods to satisfy the agenda item

Satisfaction of this agenda item will likely require several Methods as each deals with a different frequency band, a different regulatory approach and/or a different service. Each Method described below is independent from, but could be complementary to, each other. Therefore selection of any Method should not be taken to imply other Methods should not be selected.

1/1.5/5.1 Issue A

1/1.5/5.1.1 Method A

Add footnote(s) to RR Article **5** indicating that existing MS allocations at 4 400-4 940 MHz and 5 925-6 700 MHz can be used for AMT for flight testing if implemented in accordance with regulatory provisions that could be incorporated in a new WRC Resolution containing relevant conditions, such as maximum e.i.r.p. restrictions, coordination requirements, and separation distances. The footnote would establish that the aeronautical telemetry applications shall not cause harmful interference to nor constrain or establish priority vis-à-vis other services in the band, in particular those FSS services subject to RR Appendix **30B**. The Resolution would specify the necessary sharing constraints and other provisions for AMT for flight testing access to the subject frequency bands based on the AMT constraints that were identified in the frequency sharing studies.

Advantages:

– That provisions in RR Article **5** that recognize certain frequency bands as suitable for AMT are more likely to facilitate a worldwide harmonized approach for administrations choosing to implement aeronautical telemetry for flight testing in these bands.

– Administrations will have the assurance that ITU-R studies have demonstrated that telemetry systems can be implemented compatibly with other services allocated in these bands, in particular those FSS services subject to RR Appendix **30B** provided that the appropriate sharing conditions specified in the new WRC Resolution are maintained.

– This WRC-07 recognition will give manufacturers and test range operators a measure of certainty for the substantial investment in range infrastructure that will be incurred and is consistent with long-standing ITU-R practice.

Disadvantages:

– This method is considered by some administrations to be outside the scope of the agenda item because it does not require designation of existing mobile allocations below but only above 16 GHz for wideband aeronautical telemetry and associated telecommand. Some administrations are of the view that Issue A deals only with the quantity of the spectrum required.

– This method creates constraints on an existing unconstraint primary allocation for the possible use of AMT.

– These bands are heavily used by other services (FSS, FS, etc.) and such a designation could lead to a misunderstanding by manufacturers and operators for their future investments due to a potential limited deployment in these bands.

– The deployment of FSS in the band 4 500-4 800 MHz including RR Appendix **30B** allotment Plan will likely be constrained.

1/1.5/5.2 Issue B

It was concluded that no change is required.

1/1.5/5.3 Issue C

1/1.5/5.3.1 Method C1 (5 030-5 091 MHz)

The addition in RR Article **5** of new AMS allocations limited to telemetry to support testing of aircraft in the band 5 030-5 091 MHz in the Table of Frequency Allocations and additions or modifications of associated footnotes. A specific footnote will incorporate by reference the PDN Recommendation ITU-R M.[AMT 5 030-5 250 MHz] and will contain a reference to a new Resolution which details the constraints on AMT to protect other services.

Advantages:

– That provisions in RR Article **5** that identify new frequency bands for AMT for flight testing will facilitate a worldwide harmonized approach for administrations choosing to implement aeronautical telemetry for flight testing in these bands and give manufacturers and test range operators a measure of certainty for the substantial investment in range infrastructure that will be incurred and is consistent with long-standing ITU-R practices.

– Administrations will have the assurance that ITU-R studies have demonstrated that telemetry systems can be implemented compatibly with other services allocated in these bands provided that the appropriate sharing conditions specified in the new Recommendation ITU-R M.[AMT 5 030-5 250 MHz] and/or in the new WRC Resolutions are maintained.

– The allocation will improve the spectrum usage as only a few MHz would be used around any airport for MLS application and therefore leave a significant part of the bandwidth for AMT for flight testing.

– Allocation of this band would increase the options available and flexibility for AMT.

Disadvantages:

– In order to protect airborne MLS receivers from harmful interference generated by stations using co-frequency airborne transmissions, large geographical separation distances are required. This would impose constraints on the operation and future development of ARNS systems. In addition, operational issues specific to safety services need to be considered. Therefore no change of the existing allocation in the band 5 030-5 091 MHz should be made.

– Recently, ICAO SARPs for MLS were amended, including the need for larger separation distances between MLS facilities than originally assumed. Therefore, at least the whole of the band 5 030-5 091 MHz is required in areas with a high density of airports using or planning to use MLS, to satisfy requirements for MLS. Aircraft and airport installations of MLS are in progress.

– Appropriate geographical separation distances to protect the MLS from non-aeronautical interference are still under study within the ITU-R.

1/1.5/5.3.2 Method C2 (5 091-5 150 MHz)

To allocate the frequency band 5 091-5 150 MHz to aeronautical mobile service (AMS) for use by aeronautical mobile telemetry for flight testing.

1/1.5/5.3.2.1 Method C2a

An RR Article **5** footnote and new WRC Resolution would establish the conditions governing how any new allocation under which AMT could be implemented in the 5 091-5 150 MHz band. The footnote would establish that the aeronautical telemetry applications for flight test would not constrain or establish priority vis-à-vis other services in the band. The Resolution would specify the necessary sharing constraints and other provisions for AMT access to the subject frequency bands based on the AMT constraints that were identified in the frequency sharing studies.

Advantages:

– That provisions in RR Article **5** that identify new frequency bands for AMT for flight testing will facilitate a worldwide harmonized approach for administrations choosing to implement aeronautical telemetry for flight testing in these bands.

- Administrations will have the assurance that ITU-R studies have demonstrated that telemetry systems can be implemented compatibly with other services allocated in these bands, provided that the appropriate sharing conditions specified in the proposed Resolutions are maintained.
- This WRC-07 recognition will give manufacturers and test range operators a measure of certainty for the substantial investment in range infrastructure that will be incurred and is consistent with long-standing ITU-R practice.
- ITU-R studies show that planned AMT can be precluded from interfering with MLS through the use of adequate frequency separation. Due to the expected lower density use of this band for MLS, provision of that frequency separation should be simpler.

Disadvantages:

- In order to protect airborne MLS receivers from harmful interference generated by stations using co-frequency airborne transmissions, geographical separation distances of a few hundred kilometres are required making sharing of the band with AMT difficult in some areas where a high density of MLS is planned to be implemented.
- In order to protect AM(R)S receivers (if allocated by WRC-07 in the band 5 091-5 150 MHz) from harmful interference generated by stations using airborne transmissions, a hard limit may be required .
- Secondary status would not give to AMT operators long term guaranteed operating guidelines relative to other services.

1/1.5/5.3.2.2 Method C2b

The addition in RR Article **5** of new MS, limited to AMS allocation in the band 5 091-5 150 MHz limited to aeronautical mobile telemetry for flight testing under the condition that if an allocation to AM(R)S is made under Agenda item 1.6 in the same band that the AM(R)S allocation shall take precedence over the use of the band by aeronautical mobile telemetry. A Resolution would specify the necessary sharing constraints and other provisions for AMT access to the subject frequency bands based on the AMT constraints that were identified in the frequency sharing studies.

Advantages:

- ITU-R studies show that planned AMT can be precluded from interfering with MLS through the use of adequate frequency separation. Due to the expected lower density use of this band for MLS, provision of that frequency separation should be simpler.
- That provisions in RR Article **5** that identify new frequency bands for AMT for flight testing will facilitate a worldwide harmonized approach for administrations choosing to implement aeronautical telemetry for flight testing in these bands.

– Administrations will have the assurance that ITU-R studies have demonstrated that telemetry systems can be implemented compatibly with other services allocated in these bands, provided that the appropriate sharing conditions specified in the proposed Resolutions are maintained.
– This WRC-07 recognition will give manufacturers and test range operators a measure of certainty for the substantial investment in range infrastructure that will be incurred and is consistent with long-standing ITU-R practice.

Disadvantages:

– In order to protect airborne MLS receivers from harmful interference generated by stations using co-frequency airborne transmissions, geographical separation distances of a few hundred kilometres are required making sharing of the band with AMT difficult in some areas where a high density of MLS is planned to be implemented.
– In order to protect AM(R)S receivers (if allocated by WRC-07 in the band 5 091-5 150 MHz) from harmful interference generated by stations using airborne transmissions, hard limits may be required.
– Secondary status vis-à-vis AM(R)S would not give to AMT operators long term guaranteed operating guidelines relative to other services.

1/1.5/5.3.2.3 Method C2c

The addition in RR Article **5** of new AMS allocations limited to telemetry to support testing of aircraft in the band 5 091- 5 150 MHz in the Table of Frequency Allocations and additions or modifications of associated footnotes. A specific footnote will incorporate by reference the PDN Recommendation ITU-R M.[AMT 5 030-5 250 MHz] which details the constraints on AMT to protect other services.

Advantages:

– That provisions in RR Article **5** that identify new frequency bands for AMT for flight testing will facilitate a worldwide harmonized approach for administrations choosing to implement aeronautical telemetry for flight testing in these bands.
– Administrations will have the assurance that ITU-R studies have demonstrated that telemetry systems can be implemented compatibly with other services allocated in these bands, provided that the appropriate sharing conditions are specified in a new Recommendation ITU-R M.[AMT 5 030-5 250 MHz] and/or a new WRC Resolution.
– This WRC-07 recognition will give manufacturers and test range operators a measure of certainty for the substantial investment in range infrastructure that will be incurred and is consistent with long-standing ITU-R practice.
– ITU-R studies show that planned AMT can be precluded from interfering with MLS through the use of adequate frequency separation. Due to the expected lower density use of this band for MLS, provision of that frequency separation should be simpler.

Disadvantage:

– In order to protect AM(R)S receivers (if allocated by WRC-07 in the band 5 091-5 150 MHz) from harmful interference generated by stations using airborne transmissions, hard limits may be required.

1/1.5/5.3.3 Method C3 (5 150-5 250 MHz)

The addition in RR Article **5** of new AMS allocations limited to telemetry to support testing of aircraft in the band 5 150-5 250 MHz in the Table of Frequency Allocations.

1/1.5/5.3.3.1 Method C3a

Additions or modifications of associated footnotes in RR Article **5**. A specific footnote will specify that AMT limited to flight testing shall be subject to the condition that no protection is claimed from the fixed-satellite service and other mobile services, and RR No. **5.43A** does not apply. This footnote will also incorporate by reference the PDN Recommendation ITU-R M.[AMT 5 030-5 250 MHz] which details the constraints on AMT to protect other services.

Advantages:

– That provisions in RR Article **5** that identify new frequency bands for AMT for flight testing will facilitate a worldwide harmonized approach for administrations choosing to implement aeronautical telemetry for flight testing in these bands.

– Administrations will have the assurance that ITU-R studies have demonstrated that telemetry systems can be implemented compatibly with other services allocated in these bands, provided that the appropriate sharing conditions are specified in a new Recommendation ITU-R M.[AMT 5 030-5 250 MHz] and/or in a new WRC Resolutions.

– Including limits in the RR will identify to AMT operators clear operating guidelines relative to other services.

– This WRC-07 recognition will give manufacturers and test range operators a measure of certainty for the substantial investment in range infrastructure that will be incurred and is consistent with long-standing ITU-R practice.

– Allocation of this band would increase the options available and flexibility for AMT.

Disadvantages:

– Some administrations believe that the bands that include existing primary mobile (except aeronautical mobile) service allocations, such as the 5 150-5 250 MHz band, are more appropriately addressed under Issue A (*resolves* 1 of Resolution **230 (WRC-03)**) and not within the scope of *resolves* 3.

– Some administrations do not agree that studies have adequately demonstrated that aeronautical mobile telemetry in 5 150-5 250 MHz band are compatible with existing services. The 5 150-5 250 MHz band is already encumbered by existing allocations and the addition of AMT will result in excessive interference and constraints to the MSS feeder links, RDSS feeder links and MS (WAS).
– There is currently no regulatory process proposed for 5 091-5 250 MHz to guarantee a limit to the number of AMS stations operating co-frequency and simultaneously within the MSS feeder-link satellite receive beam and hence the aggregate interference from AMS, which is especially pertinent for this band which is also shared with MS (WAS), unlike the situation below 5 150 MHz.
– AMS could constrain the deployment of MS (WAS) stations, which are generally intended to be deployed ubiquitously in 5 150-5 250 MHz (see, e.g. *noting* a) and b) from Recommendation ITU-R M.1652), if not appropriately addressed in regulatory provisions.

1/1.5/5.3.3.2 Method C3b

Allocate the frequency band 5 150-5 250 MHz to AMS subject to obtaining agreement from other administrations under RR No. **9.21**.

Advantages:

– That provisions in RR Article **5** that identify new frequency bands for AMT for flight testing will facilitate a worldwide harmonized approach for administrations choosing to implement aeronautical telemetry for flight testing in these bands.
– The allocation satisfies a limited interest in AMT systems in the 5 150-5 250 MHz band.
– Preserves the rights of administrations to protect their radiocommunication services operating in accordance with the Table of Frequency Allocations.
– Gives administrations planning to use AMT flexibility in establishing operational requirements for AMT in this frequency band.
– Allocation of this band would increase the options available and flexibility for AMT.

Disadvantages:

– Some administrations believe that the bands that include existing primary mobile (except aeronautical mobile) service allocations, such as the 5 150-5 250 MHz band, are more appropriately addressed under Issue A (*resolves* 1 of Resolution **230 (WRC-03)**) and not within the scope of *resolves* 3.

– Some administrations do not agree that studies have adequately demonstrated that aeronautical mobile telemetry in 5 150-5 250 MHz band are compatible with existing services. The 5 150-5 250 MHz band is already encumbered by existing allocations and the addition of AMT will result in excessive interference and constraints to the MSS feeder links, RDSS feeder links and MS (WAS).
– There is currently no regulatory process proposed for 5 150-5 250 MHz to guarantee a limit to the number of AMS stations operating co-frequency and simultaneously within the MSS feeder-link satellite receive beam and hence the aggregate interference from AMS which is especially pertinent for this band which is also shared with MS (WAS), unlike the situation below 5 150 MHz.
– AMS could constrain the deployment of MS (WAS) stations, which are generally intended to be deployed ubiquitously in 5 150-5 250 MHz (see, e.g. *noting* a) and b) from Recommendation ITU-R M.1652), if not appropriately addressed in regulatory provisions.
– The protection of satellite receivers of the FSS will not be guaranteed by RR No. **9.21**.

1/1.5/5.4 Issue D

It was concluded that no change is required.

1/1.5/6 Regulatory and procedural considerations

For all methods in § 1/1.5/5 the relevant portions of the Table of Frequency Allocations would require to be modified in accordance with each method. In addition the following footnotes and associated provisions that could be incorporated in resolutions would also be required appropriate to each method.

1/1.5/6.1 Method A

Example of regulatory provisions

In the bands 4 400-4 500, 4 500-4 800, 4 800-4 990 and 5 925-6 700 MHz.

ADD

5.AT1 The bands 4 400-4 940 MHz and 5 925-6 700 MHz are suitable for the implementation of aeronautical mobile telemetry applications for flight testing by aircraft stations. The provisions of RR No. **1.83** apply. Any such use does not preclude the use of these bands by other mobile service applications or by other services to which these bands are allocated on a co-primary basis and does not establish priority in the Radio Regulations. Resolution **[AMT4-6GHz] (WRC-07)** shall apply.

In the band 4 800-4 990 MHz:

MOD

5.442 In the band~~s 4 825-4 835 MHz and~~ 4 950-4 990 MHz, the allocation to the mobile service is restricted to the mobile, except aeronautical mobile, service. <u>In the band 4 825-4 835 MHz, applications in the aeronautical mobile service are limited to aeronautical mobile telemetry for flight testing in the air-to-ground direction. Resolution **[AMT4-6GHz] (WRC-07)** shall apply.</u>

Example of regulatory provisions that would need to be included in an appropriate Resolution – Resolution [AMT4-6GHz] (WRC-07):

resolves

1 that administrations take into account that the bands 4 400-4 940 MHz and 5 925-6 700 MHz are suitable for the implementation of aeronautical mobile telemetry applications for flight testing;

2 that administrations implementing aeronautical mobile telemetry for flight test purposes, shall utilize the criteria set forth below:

– transmissions limited to those from aircraft stations only, see RR No. **1.83**;

– the peak e.i.r.p. density shall not exceed –2.2 dBW/MHz;

– limit transmissions to designated flight test areas, where flight test areas are airspace designated by administrations for flight testing within their territories;

– if operation of AMT aircraft stations are planned within 500 km of the territory of an administration in which the band 4 825-4 835 MHz is allocated to radio astronomy on a primary basis (see No. **5.443**), consult with that administration to determine whether any special measures are needed to prevent interference to their radio astronomy observations;

– in the bands 4 400-4 940 MHz and 5 925-6 700 MHz, bilateral coordination for transmitting AMT aircraft station with respect to receiving fixed or mobile stations must be effected if the AMT aircraft station will operate within 450 km of the receiving fixed or mobile stations of another administration. The following procedure should be used to establish whether fixed or mobile service receiver within 450 km of the flight test area will receive an acceptable level of interference:

  – determine if the receiving fixed or mobile station's antenna main beam axis, out to a distance of 450 km from the fixed service receiver, passes within 12 km of the designated area used by transmitting AMT aircraft stations, where this distance is measured orthogonally from the main beam axis projection on the earth's surface to the nearest boundary of the projection of the flight test area on the earth's surface;

  – if the main beam axis does not intersect the flight test area or any point within the 12 km offset, the interference could be accepted. Otherwise further bilateral coordination discussions would be needed.

1/1.5/6.2 Method C1

Example of regulatory provisions

In the band 5 030-5 091 MHz:

ADD

5.AT2 The use of the band 5 030-5 150 MHz by aeronautical mobile service is limited to:

– systems operating under aeronautical mobile (R) service and in accordance with international aeronautical standards limited to surface applications at airports;

– transmissions of telemetry limited to flight testing and compliant to Resolution **[AMT5GHz] (WRC-07)**;

– aeronautical security transmissions in the band 5 091-5 150 MHz.

These applications shall take into account the operations and deployments of the microwave landing system in the aeronautical radionavigation service.

ADD

5.AT3 In the band 5 030-5 250 MHz, aircraft stations operating in the aeronautical mobile service limited to telemetry for flight testing shall operate in accordance with Annex 1 of PDNR ITU-R M.[AMT 5 030-5 250 MHz] and a new Resolution. The pfd limits in Annex 1 which protect terrestrial services may be exceeded on the territory of any country whose administration has so agreed.

Example of regulatory provisions that would need to be included in an appropriate Resolution – Resolution [AMT5GHz] (WRC-07):

resolves

1 that administrations choosing to implement aeronautical mobile telemetry for flight test purposes in the band 5 030-5 150 MHz shall utilize the criteria set forth below:

– limit transmissions to those from aircraft stations only, see RR No. **1.83**;

– bilaterally coordinate with administrations operating microwave landing systems and whose territory is located with the distance D of the AMT flight area, where D is determined by the following equation:

$$D = 43 + 10^{(127.55 - 20 \log(f) + E)/20}$$

where:

D: distance separation (km) triggering the coordination

f: minimum frequency (MHz) used by the AMT system

E: peak equivalent isotropically radiated power density (dBW in 150 kHz) of the aircraft transmitter.

1/1.5/6.3 Method C2 (5 091-5 150 MHz)

1/1.5/6.3.1 Method C2a

Example of regulatory provisions

ADD

5.AT4 The band 5 091-5 150 MHz is also allocated to the aeronautical mobile service limited to flight test telemetry transmissions by aircraft stations. Any such use does not preclude the use of this band by other services to which this band is allocated to on a co-primary basis and does not establish priority in the Radio Regulations. Resolution **[AMT5GHz] (WRC-07)** shall apply.

Example of regulatory provisions that would need to be included in an appropriate resolution – Resolution [AMT5GHz] (WRC-07):

resolves

1 that administrations take account that the band 5 091-5 150 MHz has been allocated to AMS, limited to implementation of aeronautical mobile telemetry applications for flight test purposes, based on the ITU studies referred to in *noting a)* and *b)* above;

2 that administrations choosing to implement aeronautical mobile telemetry for flight test purposes in the band 5 091-5 150 MHz shall utilize the criteria set forth below:

– limit transmissions to those from aircraft stations only, see RR No. **1.83**;

– transmissions limited to designated flight test areas, where flight test areas are airspace designated by administrations for flight test within their territories;

– limit the aggregate of any interference from all AMS including AMT aircraft stations transmissions to the fixed-satellite service spacecraft receivers to no more than 3% delta $T_{satellite}/T_{satellite}$;

– bi-laterally coordinate with administrations operating microwave landing systems and whose territory is located with the distance D of the AMT flight area, where D is determined by the following equation:

$$D = 43 + 10^{(127.55 - 20\log(f) + E)/20}$$

where:

D: distance separation (km) triggering the coordination

f: minimum frequency (MHz) used by the AMT system

E: peak equivalent isotropically radiated power density (dBW in 150 kHz) of the aircraft transmitter.

1/1.5/6.3.2 Method C2b

Example of regulatory provisions (see also RR No. **5.AM2** proposed in § 1/1.6/6.4, the text of which is reproduced below for easy reference).

5.AM2 The band 5 091-5 150 MHz is also allocated to the aeronautical mobile (R) service on a primary basis, limited to surface applications at airports by systems operating in accordance with recognized international aeronautical standards. Such use shall be in accordance with Resolution **[AM(R)S-5 GHz] (WRC-07)**.

ADD

5.AT5 Additional allocation: the band 5 091-5 150 MHz is also allocated to the aeronautical mobile service limited to aeronautical telemetry applications. Such use shall not cause harmful interference to nor claim protection from the aeronautical mobile (R) service. The requirements of the aeronautical mobile (R) service shall take precedence over the use of this band by the mobile, including aeronautical mobile, service.

1/1.5/6.3.3 Method C2c

In the band 5 091-5 150 MHz:

Add footnotes RR Nos. **5.AT2** and **5.AT3** as detailed in Method C1.

Example regulatory provisions as per Method C1.

1/1.5/6.4 Method C3 (5 150-5 250 MHz)

1/1.5/6.4.1 Method C3a

Add footnote RR No. **5.AT3** as detailed in Method C1.

ADD

5.AT6 The use of the band 5 150-5 250 MHz by aeronautical mobile service is limited to transmissions of telemetry limited to flight testing and shall be subject to the condition that no protection is claimed from the fixed satellite service and other mobile services. No. **5.43A** does not apply.

1/1.5/6.4.2 Method C3b

ADD

5.AT7 The band 5 150-5 250 MHz can also be used for aeronautical mobile service subject to agreement obtained in accordance with No. **9.21**.

Agenda item 1.6

"to consider additional allocations for the aeronautical mobile (R) service in parts of the bands between 108 MHz and 6 GHz, in accordance with Resolution 414 (WRC-03) and, to study current satellite frequency allocations, that will support the modernization of civil aviation telecommunication systems, taking into account Resolution 415 (WRC-03)"

Executive summary

Agenda item 1.6 addresses two Resolutions (Resolutions **414 (WRC-03)** and **415 (WRC-03)**) and four issues related to the aeronautical mobile (R) service and modernization of civil aviation telecommunications systems. Issues A to C relate to additional allocation of spectrum for AM(R)S in parts of the bands between 108 MHz and 6 GHz. Issue D relates to use of current satellite frequency allocations to meet aeronautical requirements to support the modernization of civil aviation telecommunication systems, especially those in developing countries, paying particular attention to those radio frequencies that could be used to support both ICAO CNS/ATM systems and other non-aeronautical telecommunication services.

Issues A, B and C (Resolution 414 (WRC-03))

Existing aeronautical mobile (route) service (AM(R)S) bands are currently nearing saturation in parts of Regions 1 and 2. In addition, new applications for AM(R)S are stated in Resolution **414 (WRC-03)**.

Based on available studies, two distinct categories of AM(R)S spectrum are required. The first – for surface applications at airports – is distinguished by a high data throughput, however only moderate transmission distances and it is expected that a single resource can be shared at multiple geographic locations. The second category, like the current very high frequency (VHF) AM(R)S, will require longer propagation distances (e.g. out to radio line-of-sight), moderate bandwidth, and a number of distinct channels to allow for sector-to-sector assignments. Initial estimates of potential spectrum requirements have been determined taking into account evolving aeronautical applications, and integration of a new system on an aircraft. The estimates are: approximately 60-100 MHz for surface applications at airports, and approximately 60 MHz for radio line-of-sight applications.

These spectrum requirements can be accommodated within the bands currently available for use by aeronautical systems in the frequency range between 108 MHz and 6 GHz without placing undue constraints on services to which the frequency bands are currently allocated. In particular, portions of the band 108-117.975 MHz, all or portions of the band 960-1 164 MHz and all or portions of bands in the 5 000-5 150 MHz frequency range are proposed in the methods provided. It must be noted that no single band will accommodate all of the identified AM(R)S requirements, rather allocations will be required for multiple bands in order to fully satisfy the agenda item.

No studies have been performed in relation to Issue B as satisfactory results have been achieved by investigating bands currently available for use by aeronautical systems considered under Issue A.

Finally, consistent with *considering d)*, *f)* and *g)* of Resolution **414 (WRC-03)** under Issue C, the 5 091-5 150 MHz band is also being considered to support new aviation security requirements.

Aeronautical security transmissions ensure confidential and secure communications between aircraft and ground, principally during unlawful disruption, hijacking or subversion of flight. Security requirements could include video and voice monitoring and download of security data. These applications will necessitate a complementary aeronautical mobile service (AMS) allocation to that band as shown in the method provided.

Issue D (Resolution 415 (WRC-03))

With respect to Issue D, both ground-to-ground and air-to-ground radiocommunications have been studied. VSAT networks have been identified as suitable for sharing by both aviation and other (non-aeronautical) telecommunications, while noting that proper measures must be in place, to the maximum extent possible, to satisfy the aeronautical communications requirements. For air-to-ground radiocommunications, both the 1.5/1.6 GHz MSS bands and MSS allocations at 14-14.5 GHz band and associated downlinks at 10/11/12 GHz bands were examined. It is concluded that no regulatory action is necessary for any of these bands.

Statement by the Administration of Syria:

> "Syria, on behalf of Syria, Saudi Arabia and United Arab Emirates, objected in all meetings of relevant study groups to accept issue D and to any such interpretation of Resolution 415, proposing sharing between primary allocation for a security service and a secondary satellite allocation.
>
> In addition, the use of any allocation to the ICAO CNS/ATM systems, should be a primary allocation having all the necessary security requirements. Therefore, a VSAT terminal could not be used for such services or for sharing services, unless it is designed to respond to the needs of the security requirements of AM(R)S radiocommunication as required by ICAO using a primary allocation, which is not the case of the band 14.0-14.5 GHz being a satellite secondary allocation.
>
> Therefore, they object to the content of Issue D as proposed for Agenda item 1.6, and request such objection to be attached to the CPM Report."

Resolution 414 (WRC-03) – Consideration of the frequency range between 108 MHz and 6 GHz for new aeronautical applications

1/1.6/1 **Issue A –** Resolution **414 (WRC-03)** *further resolves to invite ITU-R*

"1 to investigate, as a first step, the bands currently available for use by aeronautical systems in the frequency range between 108 MHz and 6 GHz in order to determine whether additional allocations to the aeronautical mobile (R) service are required and can be accommodated in these bands without placing undue constraints to services to which the frequency bands are currently allocated"

1/1.6/1.1 Background

Existing aeronautical mobile (R) service (AM(R)S) bands are currently nearing saturation in parts of Europe and the United States of America. In addition, new applications and concepts in air traffic management put further pressure on existing AM(R)S bands. Additionally, many of the evolving navigation and surveillance applications may not meet the ITU-defined use of propagation property of waves required in order to operate in a radionavigation band. WRC-03 provided a good example of the latter issue, with the agenda including addition of a limited AM(R)S allocation to the 108-117.975 MHz band to accommodate International Civil Aviation Organization (ICAO) standard navigation and surveillance systems. Finally, the support of pending security requirements and the accommodation of unmanned aerial vehicles (UAVs) will likely have impact on overall aviation spectrum requirements. There is significant growth forecast in the UAV sector of aviation. Though UAVs have traditionally been used in segregated airspace where separation from other air traffic can be assured, it is planned to deploy them in non-segregated airspace. If they operate in non-segregated civil airspace, they must be integrated safely and adhere to the same operational practices as conventional manned aircraft. To accommodate such actions, additional safety communication links will be required (AM(R)S and/or aeronautical mobile satellite (R) service (AMS(R)S)).

1/1.6/1.2 Summary of technical and operational studies, and relevant ITU-R Recommendations and Reports

Relevant ITU-R Recommendations: DNR ITU-R M.[8/167]; PDNR ITU-R M.[AMS-MLS]; PDNR ITU-R M.[AMT 5 030-5 250 MHz]; PDNR ITU-R M.[AM(R)S/AS 5 091-5 150 MHz].

Relevant ITU-R Reports: WDPDN Report ITU-R M.[AM(R)S 960-1164 MHz]; PDN Report ITU-R M.[AMS-FSS]; WDPDN Report ITU-R M.[AM(R)S-RNSS/RAS]; WDPDN Report ITU-R M.[AM(R)S Spectrum Requirements].

Studies have been carried out by ITU-R in response to Resolution **414 (WRC-03)**. Among the studies conducted are as follows:

An investigation on the bands currently available for use by aeronautical systems in the frequency range between 108 MHz and 6 GHz in order to determine whether additional allocations to the AM(R)S are required and can be accommodated in these bands without placing undue constraints on services to which the frequency bands are currently allocated. Studies on compatibility with regard to most non ICAO-standard systems operating in all or portions of the proposed bands 108-117.975 MHz, 960-1 164 MHz and 5 030-5 150 MHz bands currently used by aviation for navigation and surveillance have been completed, and studies for the bands 5 000-5 010 MHz and 5 010-5 030 MHz have been initiated, with one administration presenting preliminary results to ITU-R.

Parallel and joint studies are under way within administrations, ICAO, and Eurocontrol to identify the most appropriate technology to support the identified global aeronautical applications that have been identified.

1/1.6/1.3 Analysis of the results of studies

Current aviation communication bands are severely congested and further pressured by the introduction of new aviation applications and security requirements. In addition, recent experience has shown that evolving technology for navigation and surveillance may necessitate allocations that are more encompassing than simply aeronautical radionavigation service (ARNS).

Based on available studies, two distinct categories of AM(R)S spectrum are required. The first – for surface applications at airports including data links – is distinguished by a high data throughput, however only moderate transmission distances and it is expected that single frequency resources can be shared at multiple geographic locations. The second category, like the current very high frequency (VHF) AM(R)S, will require longer propagation distances (e.g. out to radio line-of-sight), moderate bandwidth, and a number of distinct channels to allow for sector-to-sector assignments. Initial estimates of potential spectrum requirements have been determined taking into account evolving aeronautical applications, and integration of a new system on an aircraft. The estimates are: approximately 60 MHz in some portion of the 960-1 164 MHz band, and approximately 60-100 MHz in some portion of the 5 000-5 150 MHz band. Studies have also shown a need for the second category in some portion of the band 112-117.975 MHz.

Although specific spectrum requirements have yet to be fully assessed, material has been received regarding UAV integration into non-segregated civil airspace. Because the pilot is located remotely from the UAV, bandwidth will be required to support, among other things, each UAV relaying ATC instructions to its respective pilot, additional operational data, encryption and interference resilience. These applications will require safety communication links in addition to those identified above. While it is expected that limited short-term requirements may be accommodated in either existing aeronautical bands allocated to AM(R)S or AMS(R)S or in the new AM(R)S allocations made under this agenda item, given the longer term plans for large-scale deployment of UAVs, further additional spectrum may be required in the future. Such additional spectrum has not been addressed in this Report.

From the investigation on the bands currently available for use by aeronautical systems in the frequency range between 108 MHz and 6 GHz, the following frequency bands are those that have been or are still being considered:

1 Some portion of the frequency range 112-117.975 MHz which is allocated to the ARNS, and to the AM(R)S (limited to support of air navigation and surveillance functions as per RR No. **5.197A**), in all Regions on a primary basis. The limitation of AM(R)S to systems that transmit navigational information in support of air navigation and surveillance functions as specified in RR No. **5.197A** should be removed from the appropriate part of the band. This band is being considered to support AM(R)S radio line-of-sight applications.

This band could be considered as a natural extension for accommodating the legacy VHF communication system. Within the existing European radionavigation plan the decommissioning of some ARNS systems is foreseen by 2015. This date however is under review and is likely to be extended. Dates currently being discussed are beyond 2020. No such plans have been developed for areas outside Europe. Compatibility of AM(R)S with existing or planned aeronautical systems operating in accordance with international aeronautical standards will be ensured by ICAO. Out-of-band compatibility with frequency modulation (FM) broadcasting will be ensured by incorporating reference to Resolution **413 (WRC-03)** in the new allocation, as well as by developing FM immunity requirements similar to those for already existing systems operating in the band 108-117.975 MHz. It should be noted that modifications to Resolution **413 (WRC-03)** may be required in order to address new AM(R)S communications allocations.

2 All or portions of the 960-1 164 MHz band that is allocated to ARNS in all Regions on a primary basis. This band is being considered to support AM(R)S for radio line-of-sight applications.

Even though in the band 960-1 164 MHz the usage is generally high, in the sub-bands 960-977 and 1 143-1 164 MHz usage is relatively low by ICAO Standard systems. The band 960-1 164 MHz is also occupied by different systems that are either operated on a nationally coordinated or on a non-interference basis. The frequency 978 MHz is designated by ICAO for the Standard Universal Access Transceiver (UAT) systems and is part of the necessary allocation to AM(R)S. Compatibility with existing or planned aeronautical systems in accordance with international aeronautical standards will be ensured by ICAO.

In some countries in Region 1, the frequency band 960-1 164 MHz is also used by systems in aeronautical radionavigation service for which no ICAO Standards and Recommended Practices (SARPs) have been developed. Studies regarding compatibility between AM(R)S and these systems need to be undertaken in the ITU-R.

3 The 5 000-5 010 MHz band which is already allocated to the AMS(R)S (subject to RR No. **9.21**) and ARNS on a primary basis in all Regions and is also allocated to the radionavigation-satellite service (RNSS) (Earth-space) on a primary basis in all Regions. This band is being considered to support surface applications at airports. Contributions to ITU-R indicate that this band is planned for use by feeder links for several global, non-geostationary orbit (non-GSO) RNSS systems, and that ITU-R Recommendations regarding the characteristics of these links are still under development. Due to the operational characteristics of the planned AM(R)S, in most cases geographic separation will suffice to ensure the compatibility of that system with radio astronomy stations operating in the adjacent 4 990-5 000 MHz band. In the few instances where radio astronomy observatories are in relative proximity to airports, local coordination can be employed to resolve any remaining issues.

4 The 5 010-5 030 MHz band which is already allocated to the AMS(R)S (subject to RR No. **9.21**) and ARNS on a primary basis in all Regions and is also allocated to the RNSS (space-Earth and space-space) on a primary basis in all Regions. This band is being considered to support surface applications at airports. Contributions to ITU-R indicate that this band is planned for use by

service and feeder links for several global, non-GSO RNSS systems, and that ITU-R Recommendations regarding the characteristics of these links are still under development. Preliminary studies using currently estimated parameters for RNSS systems indicate that in the 5 010-5 030 MHz band separation distances between AM(R)S transmitters and RNSS receivers will be required. The evaluation, acceptability, operational feasibility and implementation of such distances will require further study when operational parameters for AM(R)S and RNSS systems are better defined, so regulatory text is proposed to protect those RNSS stations from harmful interference.

5 All or portions of the 5 030-5 150 MHz band which is already allocated to the ARNS on a primary basis in all Regions. The 5 091-5 150 MHz frequency range is also allocated to the fixed-satellite service (FSS) (Earth-to-space) on a primary basis. The FSS allocation is limited to feeder links of non-GSO mobile-satellite systems in the mobile-satellite service (MSS) and is subject to coordination under RR No. **9.11A**, and RR No. **5.444A** conditions apply.

With respect to AM(R)S, all or portions of the 5 030-5 150 MHz band are being considered to support surface applications at airports. Studies have concluded that compatibility can be ensured through the following provisions:

a) Use of the AM(R)S allocations shall be limited to the band 5 091-5 150 MHz and to systems on the surface of airports and operating in accordance with international (ICAO) standards, and compatibility with other existing or planned aeronautical systems operating in accordance with international aviation standards will be ensured by ICAO.

b) Consistent with RR No. **5.444** MLS will continue to receive priority over other users of the band, and studies have shown that planned AM(R)S can be precluded from interfering with MLS through the use of adequate frequency separation.

c) Co-frequency sharing between existing FSS users of the band and a new airport surface radio local area network (RLAN), based on the IEEE Standard 802.16e in Annex 3 to DN Recommendation ITU-R M.[8/167], is feasible and can be confirmed following the methodology of preliminary draft new Report ITU-R M.[AMS-FSS] and PDN Recommendation ITU-R M.[AM(R)S/AS 5 091-5 150 MHz].

AM(R)S systems operating in the band 5 091-5 150 MHz shall meet ICAO SARPs requirements which will ensure consistency with appropriate ITU-R Recommendations, and compatibility with FSS systems operating in that band. In addition, studies of the band 5 091-5 150 MHz must be undertaken by ITU-R regarding (the need for) apportioning of the FSS 3% $\Delta T_s/T_s$[5] aggregate interference limit between any new AMS, with the task of developing or revising PDN Recommendation ITU-R M.[AM(R)S/AS 5 091-5 150 MHz] to ensure that aggregate limit is not exceeded. Until those studies are completed, a provisional limit for the AM(R)S of less than *xx*%[6] $\Delta T_s/T_s$ will be applied. That value should be reviewed at a future conference, preferably WRC-11.

d) A regulatory element should be developed to ensure that AM(R)S and aeronautical security applications shall not operate co-frequency within the footprint of the FSS satellite.

e) The band 5 030-5 150 MHz has also been studied in response to WRC-07 Agenda item 1.5, and studies have shown that protection of aeronautical telemetry can be ensured via sufficient separation distances between airports using AM(R)S and aeronautical mobile telemetry ground stations.

1/1.6/2 Issue B – Resolution **414 (WRC-03)** *further resolves to invite ITU-R*

"2 to further investigate, in case the first step above would not lead to satisfactory results, also the frequency bands currently not available for use by aeronautical systems, subject to not constraining the existing and planned use of such bands, taking account of existing use and future requirements in these bands"

No studies have been performed as satisfactory results have been achieved by investigating bands currently available for use by aeronautical systems (Issue A).

1/1.6/3 Issue C – Resolution **414 (WRC-03)** *further resolves to invite ITU-R*

"3 to investigate how to accommodate the requirements for aeronautical systems in the band 5 091-5 150 MHz"

1/1.6/3.1 Background

Though this might be considered a subset of Issue A as most proposed applications would fit under AM(R)S, the item is slightly broader in that it also includes new aviation security requirements that are currently being defined internationally.

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[5] The increase (ΔT_s) in the satellite noise temperature (T_s).

[6] *xx* equals 2% if the conference allocates aeronautical mobile telemetry under Agenda item 1.5, and 3% otherwise.

1/1.6/3.2 Summary of technical and operational studies and list of relevant ITU-R Recommendations and Reports

Relevant ITU-R Recommendations and Reports: PDN Recommendation ITU-R M.[AM(R)S/AS 5 091-5 150 MHz]; PDN Report ITU-R M.[AMS-FSS].

Consistent with *considering d)*, *f)* and *g)* of Resolution **414 (WRC-03)**, the 5 091-5 150 MHz band is also being considered to support new aviation security requirements. Aeronautical security transmissions ensure confidential and secure communications between aircraft and ground, principally during unlawful disruption, hijacking or subversion of flight. Security requirements could include video and voice monitoring and download of security data. These applications will necessitate a complementary aeronautical mobile service (AMS) allocation.

Studies have been performed considering the use of code division multiple access (CDMA) technology. Flight trials conducted by Eurocontrol have proven successful operation beyond the 100 km range. It has been shown that this range will be reduced by precipitation, however this is still considered sufficient for security operations. Studies have indicated that sharing between FSS, AM(R)S and AMS is achievable although the FSS may itself cause occasional interference to the AMS.

Studies regarding compatibility of the AMS aeronautical security system with the ARNS, AM(R)S and AMS(aeronautical mobile telemetry) have not been completed and are necessary before any usage of this band by aeronautical security applications.

1/1.6/3.3 Analysis of the results of studies

With respect to protection of FSS, studies (see PDN Report ITU-R M.[AMS-FSS] and PDNR ITU-R M.[AM(R)S/AS 5 091-5 150 MHz]) also show the feasibility of co-frequency sharing between existing FSS users of the band and aeronautical security applications. It must be noted that the above result of studies is only valid if the AMS aeronautical security applications stations will not operate co-frequency with AM(R)S surface applications at airports within the footprint of an FSS satellite. Regulation implementation needs to be studied in respect with this coordination.

In the case of non co-frequency usage between aeronautical security applications and AM(R)S, results of the interference analysis have concluded that studies of the band 5 091-5 150 MHz must be undertaken regarding the apportioning of the FSS 3% $\Delta T_s/T_s$ aggregate interference limit between any new AMS, with the task of developing or revising PDN Recommendation ITU-R M.[AM(R)S/AS 5 091-5 150 MHz] to ensure that aggregate limit is not exceeded. Until those studies are completed, stations in the AMS, limited to aeronautical security applications, should be designed in such a manner that the transmitter power flux-density is limited to -140.25 dB(W/(m^2 · 1.23 MHz)) at an FSS satellite using full Earth coverage receive antennas with an orbit of 1 414 km. This value should be reviewed at a future conference, preferably WRC-11.

Sharing studies with the other services (e.g. ARNS, aeronautical telemetry, AM(R)S) of this band will need to be completed before any usage of this band by aeronautical security applications.

Resolution 415 (WRC-03) – Study of current satellite frequency allocations that will support the modernization of civil aviation telecommunications systems

1/1.6/4 Issue D – Resolution 415 (WRC-03) *invites ITU-R*

"1 to study, as a matter of urgency, the current satellite frequency allocations that could meet aeronautical requirements to support the modernization of civil aviation telecommunication systems, especially those in developing countries, and to study in particular those radio frequencies that could be used to support both ICAO CNS/ATM systems and other non-aeronautical telecommunication services"

1/1.6/4.1 Background

Resolution **415 (WRC-03)** resolved to invite WRC-07 to examine "the possibility of broadening the services and applications of the use of current satellite frequency allocations in order to allow the expansion of ICAO CNS/ATM[7] systems that can also support other non-aeronautical telecommunication services". It takes into consideration that satellite communication systems provide a real possibility to meet the demands of such systems, especially in areas (e.g., developing countries) where a terrestrial communication infrastructure is not available.

Civil aviation radiocommunication systems fall into two basic categories: a) ground-to-ground radiocommunications and b) air-to-ground radiocommunications (this refers to all radiocommunications to and from aircraft). These need to be examined separately as certain aspects have some distinctly different attributes.

a) *Ground-to-ground radiocommunications*

Three different ground-to-ground telecommunication systems are in use in aviation:

i) Direct speech circuits between air traffic control (ATC) centres either within a country or between ATC centres of different countries and different air traffic service (ATS) providers in adjacent flight information regions (FIRs), often spanning vast distances.

ii) Data link circuits between (adjacent) ATC centres, forming part of a global aeronautical data link network.

iii) Relay of air-to-ground message exchanges with the aircraft via remote VHF ground sites.

These radiocommunications form an integral part of the ICAO CNS/ATM strategy and in particular the Aeronautical Telecommunications Network (ATN) and use a variety of different systems for connectivity. These connectivity systems can be landlines over the local PSTN, fixed service links, HF radio and satellite links.

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[7] ICAO CNS/ATM is the acronym for International Civil Aviation Organization, Communication, Navigation and Surveillance/Air Traffic Management.

For these systems, ICAO Standards and Recommended Practices (SARPs) and relevant guidance material have been developed. Implementation of these systems is coordinated on a regional basis, taking into account the specific operational requirements for each link.

b) *Air-to-ground radiocommunications*

These include all voice and data communications involving the aircraft and ground facilities. These air-ground radiocommunications have been direct from the aircraft to the ATC centre or the airline operational facility via VHF or HF radio and, more recently, satellite links operating in the 1 525-1 559 MHz and 1 626.5-1 660.5 MHz range of frequencies. The orders of priority for communications in aeronautical mobile and mobile-satellite services are defined in RR Article **44**. Categories 1 to 6 are consistent with safety services. It is to be noted that the AMS(R)S communications with priority 1 to 6, because of their safety of life nature, are only to be carried in bands allocated on a primary basis.

Types of communication are:

i) *Voice communications*

Air-to-ground voice radiocommunications are normally direct radio communications between the pilot and the ATC-centre responsible for the aircraft or the pilot and the company operational control center. These communications are making use of radio systems operating in the HF bands, the VHF band as well as satellite systems in relevant allocated bands.

ii) *Data link communications*

ICAO has developed SARPs for a number of air-to-ground data link systems operating in the HF, VHF and the UHF (960-1 215 MHz) frequency bands, as well as in the bands allocated to the MSS in the 1.5/1.6 GHz range. The performance of these systems is expected to meet the operational requirements for the next 5-10 years in congested areas, although in some cases higher performance data links may be required. As and when necessary, ICAO will develop the necessary SARPs for such systems.

Over oceanic areas, the radiocommunications are either by satellite in the 1.5/1.6 GHz band or HF radio. The standards are compliant with the ATN and X.25 protocols, namely narrow band and low bit rate.

The MSS bands in the 1 525 to 1 559 MHz and 1 626.5 to 1 660.5 MHz range have been used for aeronautical CNS/ATM services for many years − there are currently about 7 000 aircraft equipped with aircraft earth stations which operate in these bands.

1/1.6/4.2 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations and provisions of the RR

Relevant ITU-R Recommendations: ITU-R M.1643, ITU-R M.1037, ITU-R M.1089-1, ITU-R M.1180, ITU-R M.1184-2, ITU-R M.1229, ITU-R M.1233-1, ITU-R M.1234-1.

1/1.6/4.2.1 Ground-to-ground radiocommunications

In respect to ground-to-ground radiocommunications, VSAT networks have generally been successful in achieving large improvements in quality of service and extending capabilities of aeronautical communications (voice and data). However it has been noted that there were still deficiencies in regions where the implementation of such VSAT systems was not interoperable between systems and this was a concern.

In various cases, in particular in remote or rural areas, it would be beneficial, both for aviation and other (non-aeronautical) telecommunications to share VSAT links. In such cases however, priority, to the maximum extent possible, should be given to satisfy the aeronautical communication requirements and/or restore, in case of malfunction of the link, as promptly as possible the aeronautical link. ICAO is of the view that a WRC Recommendation may provide administrations the necessary guidance in this case.

1/1.6/4.2.2 Air-to-ground radiocommunications

WRC-03 under Agenda item 1.11 adopted RR Nos. **5.504A**, **5.504B** and **5.504C** allocating the band 14-14.5 GHz to aeronautical mobile-satellite service (AMSS) (Earth-to-space) on a secondary basis under the conditions mentioned in these footnotes. Also, WRC-03, in the Summary Records of the 14th Plenary Meeting, noted that certain bands in the 10/11/12 GHz range could be used for downlinks for the AMSS under the provisions of RR No. **4.4**. These uplink and downlink bands are currently in use by the AMSS and can be used to support non-aeronautical telecommunication services having priority levels 7 through 10. No further regulatory measures are required to provide this non-safety service.

Studies with regard to the use of the 1.5/1.6 GHz MSS bands

In accordance with RR No. **5.357A**, in the bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz the priority shall be given to accommodate spectrum requirements of the aeronautical mobile-satellite service (AMS(R)S) providing transmission of messages with priority 1 to 6 in RR Article **44**. This was reinforced by WRC-2000 which adopted Resolution **222 (WRC-2000)** and also requested studies on intersystem pre-emption.

The ITU-R has examined the potential for the 1 525 to 1 559 MHz and 1 626.5 to 1 660.5 MHz MSS bands to meet the future requirements for aeronautical CNS/ATM communications taking into account recent developments in MSS systems. Studies were conducted under Resolution **222 (WRC-2000)** and the results can be found in Report ITU-R M.2073.

1/1.6/4.3 Analysis of the results of studies relating to the possible methods of satisfying the agenda item

The use of large reflector satellite antennas for MSS systems in the 1 525 to 1 559 MHz and 1 626.5 to 1 660.5 MHz bands has allowed the introduction of higher data rate MESs and also allows more efficient re-use of MSS spectrum. Due to heavy congestion in these bands, there may be difficulty in gaining access to the spectrum necessary to meet the demand for AMS(R)S communications in the future. Since future CNS/ATM services may require higher data rate carriers than is currently the case thereby increasing spectrum congestion, administrations are urged to continue to ensure that the future spectrum requirements for AMS(R)S are satisfied. This issue is not under the scope of Resolution **415 (WRC-03)**.

Future CNS/ATM services may require higher data rate carriers than is currently the case. Studies to indicate whether or not MSS systems in the 1.5/1.6 GHz range bands will be able to meet spectrum demands have not been conducted.

1/1.6/5 Methods to satisfy the agenda item

Satisfaction of this agenda item will likely require several methods as each deals with a different frequency band, a different regulatory approach and/or a different service. Each method described below is independent from, but could be complementary to, others. Therefore selection of any Method should not be taken to imply other methods should not be selected. All methods address additions in RR Article **5** of new AM(R)S allocations in the Table of Frequency Allocations and additions or modifications of footnotes and Resolution(s) to support:

1/1.6/5.1 Method 1 (Issue A)

Removal, in a portion of the 108-117.975 MHz band, of the limitation of AM(R)S to systems that transmit navigational information in support of air navigation and surveillance functions as specified in RR No. **5.197A**.

1/1.6/5.1.1 Method 1a

Remove the limitation for the portion of the band from 112-117.975 MHz.

Advantages:

– Enables greater flexibility in reduction of the congestion of the current AM(R)S band 117.975-137 MHz in some regions as well as to provide for the introduction of new global air-ground communication systems.

– As the same regulatory framework applies to all this band and an allocation to AM(R)S in all the band will give more flexibility to the coordination between ICAO systems (ARNS and AM(R)S systems) than an allocation only in the 116-117.975 MHz band.

Disadvantages:

– Compatibility between the broadcasting service in the band 88-108 MHz and AM(R)S communication systems may be more difficult.

– Potential need to reassign a greater number of ARNS assignments to accommodate AMRS.

1/1.6/5.1.2 Method 1b

Remove the limitation for the portion of the band from 116-117.975 MHz.

Advantages:

– Within the existing European radionavigation plan the decommissioning of some ARNS systems is foreseen by 2015-2020, therefore freeing up spectrum in this band.

– The ITU-R has performed analysis which demonstrates the feasibility of extending AM(R)S down to 116 MHz.

– With the AM(R)S operations limited to above 116 MHz, it may be easier to achieve mandatory compatibility requirements between the broadcasting service in the band 88-108 MHz and AM(R)S communication systems.

1/1.6/5.2 Method 2 (Issue A)

Add an AM(R)S allocation in all or a portion of the band 960-1 164 MHz to support line-of-sight communications.

1/1.6/5.2.1 Method 2a

Add an AM(R)S allocation to the band 960-1 024 MHz.

Advantages:

– ICAO and ITU-R studies indicate compatibility between AM(R)S and existing systems operating on an international basis in this band.

– Identified AMRS spectrum requirement for applications can be achieved compatibly in an ARNS ground-based system RF environment.

Disadvantages:

– There may be no room to accommodate the AM(R)S spectrum requirements as identified by ICAO (up to 60 MHz) while providing any necessary guardbands to adjacent bands.

– No studies have been conducted showing compatibility of AM(R)S systems with existing non-ICAO standardized systems in ARNS.

1/1.6/5.2.2 Method 2b

Add an AM(R)S allocation to the band 960-1 164 MHz.

Advantages:

– It is assumed that the extension of the allocation to the whole band will give more flexibility for the implementation of ICAO Standard Systems.

Disadvantages:

– The operational environment in the 1 024-1 164 MHz band is different and more complex (e.g. secondary surveillance radar, airborne ARNS transmitters) from that in the 960-1 024 MHz band and has not been studied.

– This allocation could pose out of band emissions problems with the ARNS and RNSS systems in the upper adjacent band.

– No studies have been conducted showing compatibility of AM(R)S systems with existing non-ICAO standardized systems in the ARNS.

1/1.6/5.3 Method 3 (Issue A)

Add AM(R)S allocations in the bands 5 000-5 010 MHz and 5 010-5 030 MHz to support surface applications at airports.

1/1.6/5.3.1 Method 3a

Addition of a footnote in RR Article **5** for new AM(R)S allocations in the bands 5 000-5 010 MHz and 5 010-5 030 MHz that ensures a regulatory protection of the RNSS from harmful interference due to AM(R)S, and restricts its use to surface applications.

Advantages:

– Provides a regulatory basis for ensuring that the RNSS application, both service and feeder-link are protected from harmful interference from surface applications of the AM(R)S.

– The regulatory provisions limit AM(R)S systems to airport surface applications which will help to enhance compatibility with other systems.

– Preliminary ITU-R studies indicate that the planned AM(R)S system is compatible with RNSS in the 5 000-5 010 MHz band.

– Preliminary ITU-R studies indicate that compatibility between AM(R)S in the 5 000-5 010 MHz band and radio astronomy service (RAS) stations operating in the adjacent 4 990-5 000 MHz band can be ensured through distance separations.

– Preliminary ITU-R studies indicate that compatibility between RNSS feeder-links and AM(R)S transmitters in the 5 010-5 030 MHz band can be achieved through adequate separation distances.

Disadvantages:

– Incomplete situation of sharing/compatibility studies may require the continuation of studies for future WRC cycles.

– In the 5 000-5 010 MHz band, possible interference from future RNSS feeder links into AM(R)S systems may be caused.

– In the 5 000-5 010 MHz band compatibility studies between AM(R)S and RNSS/RAS have just been initiated, and require further development as parameters for the AM(R)S and RNSS evolve.

– In the 5 010-5 030 MHz band, further studies are required to establish the technical guidelines in order not to cause harmful interference into RNSS. The evaluation, acceptability and implementation of preliminary separation distances require further study when operational parameters for AM(R)S and RNSS systems are better defined, and may not be acceptable for RNSS service links.

– In the 5 010-5 030 MHz band separation distances are not considered as a practical mitigation technique for RNSS service link receivers because the RNSS receivers will be operated ubiquitously.

– Regarding the 5 010-5 030 MHz band, RNSS service links in other bands are facing congestion, and there is a need to preserve the unconstrained future use of the 5 GHz allocation for RNSS.

1/1.6/5.3.2 Method 3b

Addition of a footnote in RR Article **5** and associated WRC-07 Resolution for new AM(R)S allocations in the bands 5 000-5 010 MHz and 5 010-5 030 MHz that ensures regulatory protection of the RNSS from harmful interference due to AM(R)S, restricts its use to surface applications and requests WRC-11 to reconsider the issue after additional technical studies are completed.

Advantages:

– A new entry in the Table of Frequency Allocations and new or modified footnotes in RR Article **5** that identify frequency bands for the AM(R)S will facilitate worldwide harmonized approach to implementation of new aeronautical communications systems in the identified bands.

– The regulatory provisions limit AM(R)S systems to airport surface applications which will help to enhance compatibility with other systems.

– Preliminary ITU-R studies indicate that the planned AM(R)S system is compatible with RNSS in the 5 000-5 010 MHz band.

– Preliminary ITU-R studies indicate that compatibility between AM(R)S in the 5 000-5 010 MHz band and radio astronomy stations operating in the adjacent 4 990-5 000 MHz band can be ensured through distance separations.

– Preliminary ITU-R studies indicate that compatibility between RNSS feeder-links and AM(R)S transmitters in the 5 010-5 030 MHz band can be achieved through adequate separation distances.

– Including an attached Resolution allows for an explicit request that the issue be revisited by WRC-11, after the completion of technical studies which have only been initiated at this stage.

Disadvantages:

– Incomplete situation of sharing/compatibility studies may require the continuation of studies for future WRC cycles.

– In the 5 000-5 010 MHz band, possible interference from future RNSS feeder-links into AM(R)S systems may be caused.

– In the 5 000-5 010 MHz band compatibility studies between AM(R)S and RNSS/RAS have just been initiated, and require further development as parameters for the AM(R)S and RNSS evolve.

– In the 5 010-5 030 MHz band, further studies are required to establish the technical guidelines in order not to cause harmful interference into RNSS. The evaluation, acceptability and implementation of preliminary separation distances require further study when operational parameters for AM(R)S and RNSS systems are better defined, and may not be acceptable for RNSS service links.

– In the 5 010-5 030 MHz band separation distances are not considered as a practical mitigation technique for RNSS service link receivers because the RNSS receivers will be operated ubiquitously.

– Regarding the 5 010-5 030 MHz band, RNSS service links in other bands are facing congestion, and there is a need to preserve the unconstrained future use of the 5 GHz allocation for RNSS.

1/1.6/5.4 Method 4 (Issue A)

Add an AM(R)S allocation in the frequency range 5 091-5 150 MHz to support surface applications at airports.

Advantages:

– ITU-R studies show that planned AM(R)S can be precluded from interfering with MLS through the use of adequate frequency separation. Due to the expected lower density use of this band for MLS, provision of that frequency separation should be simpler.

– Recently, ICAO SARPs for MLS were amended, including the need for larger separation distances between MLS facilities than originally assumed. Therefore, the whole of the band 5 030-5 091 MHz is required to satisfy requirements for MLS, and aircraft and airport installations are in progress in some countries. Co-frequency MLS/AM(R)S would require large geographic separations. In addition, viability of the frequency management necessary for frequency separation has not yet been studied. As a result, it may only be possible to deploy AM(R)S in the band 5 091-5 150 MHz.

– ICAO currently has no plans to standardize an AM(R)S system in the 5 030-5 091 MHz band.

Disadvantages:

– No disadvantages were identified.

1/1.6/5.5 Method 5 (Issue C)

Add an AMS allocation in the band 5 091-5 150 MHz limited to aeronautical security applications.

Advantages:

– New entry in the Table of Frequency Allocations and new or modified footnotes in RR Article **5** that identify this frequency band for AMS aeronautical security will promote a global harmonized approach to implementation in the identified band.

– Preliminary ITU-R studies have shown compatibility with the FSS.

Disadvantage:

– Compatibility studies with other services in the band have not been completed.

1/1.6/5.6 Method for Issue D

With respect to the ground-to-ground aspect, there does not appear to be any need to make amendments to the Table of Frequency Allocations or any other part of the Radio Regulations. However, if technical guidance is required to encourage administrations in developing countries and in remote and rural areas to implement VSAT terminals that, as required, could support both aeronautical[8] and other radiocommunication requirements with the necessary considerations given to aeronautical communications requirements, it would be best produced in the form of an ITU document detailing the issues and other aspects that may be deemed appropriate during the course of further studies.

In examining the air-to-ground scenario:

No changes to the RR are required as a result of Agenda item 1.6 Resolution **415 (WRC-03)**.

1/1.6/6 Regulatory and procedural considerations

The Administrations of Algeria, Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Mauritania, Oman, Qatar, Syrian Arab Republic and Tunisia object to any regulatory solution permitting the use of the band 108-112 MHz for aeronautical mobile (R) service.

In the methods below it is proposed that the modifications to the provisions of RR Article **5** and Resolutions would apply from the date of the end of WRC-07.

1/1.6/6.1 Method 1 – The band 108-117.975 MHz

In the following examples of regulatory text, XVB is to be replaced by values appropriate to each method. For Method 1a XVB = 112 MHz; for Method 1b XVB = 116 MHz.

[8] Taking into consideration that such requirements need primary allocations.

MOD

108-117.975 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
108-117.975	AERONAUTICAL RADIONAVIGATION 5.197 MOD 5.197A	

MOD

5.197A The band 108-117.975 MHz ~~may also be used by~~is also allocated on a primary basis to the aeronautical mobile (R) service ~~on a primary basis,~~ limited to systems ~~that transmit navigational information in support of air navigation and surveillance functions~~operating in accordance with recognized international ~~aviation~~aeronautical standards. Such use shall be in accordance with Resolution **413 (Rev.WRC-0~~3~~7)** ~~and shall not cause harmful interference to nor claim protection from stations operating in the aeronautical radionavigation service which operate in accordance with international aeronautical standards~~. Moreover, use of the band 108-XVB MHz by the aeronautical mobile (R) service is limited to systems that transmit navigational information in support of air navigation and surveillance functions in accordance with recognized international aeronautical standards. (WRC-0~~3~~7)

MOD

RESOLUTION 413 (Rev.WRC-0~~3~~7)

Use of the band 108-117.975 MHz by aeronautical services

The World Radiocommunication Conference (Geneva, 2007~~3~~),

considering

NOC

a) to *e)*

f) the need for the aeronautical community to provide additional services for communications relating to safety and regularity of flight in the band XVB-117.975 MHz,

NOC

recognizing

NOC

noting

resolves

~~1 that the provisions of this Resolution and of No. **5.197A** shall enter into force on 5 July 2003;~~

1 that any AM(R)S systems operating in the band 108-117.975 MHz shall not cause harmful interference to, nor claim protection from aeronautical radionavigation service systems operating in accordance with international aeronautical standards;

2 that any ~~additional~~ aeronautical mobile (R) service systems~~[1]~~ planned to operate in the frequency band 108-117.975 MHz shall, as a minimum, meet the FM broadcasting immunity requirements contained in Annex 10 of the ICAO Convention on International Civil Aviation for existing aeronautical radionavigation systems operating in this frequency band;

3 that ~~additional~~ aeronautical mobile (R) service systems operating in the band 108-117.975 MHz shall place no additional constraints on the broadcasting service or cause harmful interference to stations operating in the bands allocated to the broadcasting service in the frequency band 87-108 MHz and No. **5.43** does not apply to systems identified in *recognizing d)*;

4 that frequencies below 112 MHz shall not be used for ~~these additional~~ aeronautical mobile (R) service systems excluding the ICAO systems identified in *recognizing d)* until all potential compatibility issues with the lower adjacent frequency band 87-108 MHz have been resolved,

NOC

invites ITU-R

NOC

instructs the Secretary-General

~~1 In the context of this Resolution, the term "additional aeronautical systems" refers to systems that transmit navigational information in support of air navigation and surveillance functions in accordance with recognized international aviation standards.~~

1/1.6/6.2 Method 2 – AM(R)S allocation in the band 960-1 164 MHz

In the following examples of regulatory text, XLB is to be replaced by values appropriate to each method. For Method 2a XLB = 1 024 MHz; Method 2b XLB = 1 164 MHz.

MOD

960-1 164 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
960-1 164	AERONAUTICAL RADIONAVIGATION 5.328 ADD 5.AM1	

ADD

5.AM1 The band 960-XLB MHz is also allocated to the aeronautical mobile (R) service on a primary basis, limited to systems that operate in accordance with recognized international aeronautical standards. Such use shall be in accordance with Resolution **[AM(R)S 960] (WRC-07)**.

ADD

RESOLUTION [AM(R)S 960] (WRC-07)

Use of the band 960-XLB MHz by aeronautical services

The World Radiocommunication Conference (Geneva, 2007),

considering

a) the current allocation of the frequency band 960-1 164 MHz to the aeronautical radionavigation service (ARNS);

b) the use of the band 960-1 215 MHz by the ARNS is reserved on a worldwide basis for the operation and development of airborne electronic aids to air navigation and any directly associated ground-based facilities per No. **5.328**;

c) that new technologies are being developed to support communications and air navigation, including airborne and ground surveillance applications;

d) that new applications and concepts in air traffic management which are data intensive are being developed;

e) that in countries listed in No. **5.312** the frequency band 960-1 164 MHz is also used by systems in aeronautical radionavigation service for which no standards and recommended practices (SARPs) have been developed and published by the International Civil Aviation Organization (ICAO), *recognizing*

a) that precedence must be given to the ARNS operating in the frequency band 960-1 164 MHz;

b) that Annex 10 of the Convention of the ICAO contains standards and recommended practices (SARPs) for aeronautical radionavigation and radiocommunication systems used by international civil aviation;

c) that all compatibility issues between the ICAO Standard Universal Access Transceiver (UAT) and other systems which operate in the same frequency range, excluding the system identified in *considering e)*, have been addressed within ICAO,

noting

that excluding the system identified in *recognizing c)*, no compatibility criteria currently exist between aeronautical mobile (R) service (AM(R)S) systems proposed for operations in the frequency band 960-XLB MHz and the existing aeronautical systems in the band,

resolves

1 that prior to operating in the frequency band 960-XLB MHz any AM(R)S systems shall have SARPs requirements published in Annex 10 of the ICAO Convention on International Civil Aviation;

2 that any AM(R)S systems operating in the band 960-XLB MHz shall not cause harmful interference to, nor claim protection from, and shall not impose constraints on the operation and planned development of aeronautical radionavigation systems operating in accordance with international (ICAO) standards in the same band;

3 that any AM(R)S systems operating in the band 960-XLB MHz shall not cause harmful interference to, nor claim protection from, and shall not impose constraints on the operation and planned development of aeronautical radionavigation systems operating in the countries identified in *considering e)*;

4 that ITU-R compatibility studies between AM(R)S systems operating in the band 960-XLB MHz and ARNS systems operating in the countries identified in *considering e)* need to be conducted to develop sharing conditions to ensure that the conditions of *resolves* 3 are satisfied;

5 that the result of the *resolves* 4 studies shall be reported to WRC-11 and the decisions should be taken by WRC-11 to review, if appropriate, regulatory provisions in *resolves* 3 taking into account protection requirements of ARNS systems operating in the countries identified in *considering e)* and the need for global facilitation of AM(R)S operating in accordance with ICAO standards;

6 to encourage administrations listed in *considering e)* and ICAO, for the purposes of conducting the ITU-R studies mentioned in *resolves* 4, to provide to ITU-R the technical and operational characteristics of systems involved,

invites ITU-R

1 to conduct studies on operational and technical means to facilitate sharing between AM(R)S systems operating in the band 960-XLB MHz and ARNS systems identified in *considering e)*;

2 to report the results of the studies to WRC-11,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

1/1.6/6.3 Method 3 – AM(R)S allocation in the bands 5 000-5 010 MHz and 5 010-5 030 MHz

MOD

5 000-5 030 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
5 000-5 010	AERONAUTICAL RADIONAVIGATION AERONAUTICAL MOBILE (R) ADD 5.AMR RADIONAVIGATION-SATELLITE (Earth-to-space) 5.367	
5 010-5 030	AERONAUTICAL RADIONAVIGATION AERONAUTICAL MOBILE (R) ADD 5.AMR RADIONAVIGATION-SATELLITE (space-to-Earth) (space-space) 5.328B 5.443B 5.367	

The following footnote would be added if Method 3a is selected:

ADD

5.AMR The bands 5 000-5 010 MHz and 5 010-5 030 MHz are also allocated to the aeronautical mobile (R) service on a primary basis. Stations in the aeronautical mobile (R) service operating in the 5 000-5 010 MHz and 5 010-5 030 MHz bands shall be subject to the condition that no harmful interference is caused to, and no protection is claimed from, the radionavigation-satellite service and such use shall be limited to stations operating on the surface of the Earth.

The following footnote and Resolution would be added if Method 3b is selected:

ADD

5.AMR The bands 5 000-5 010 MHz and 5 010- 5 030 MHz are also allocated to the aeronautical mobile (R) service on a primary basis, limited to systems operating in accordance with recognized international aeronautical standards. Such use shall be in accordance with Resolution **[AM(R)S-RNSS] (WRC-07)**.

ADD

RESOLUTION [AM(R)S-RNSS] (WRC-07)

Compatibility between the aeronautical mobile (R) service and the radionavigation-satellite service in the frequency bands 5 000-5 010 MHz and 5 010-5 030 MHz

The World Radiocommunication Conference (Geneva, 2007),

considering

a) the current allocation of the frequency band 5 000-5 010 MHz to the aeronautical mobile satellite (R) service (AMS(R)S) subject to agreement obtained under No. **9.21**, the aeronautical radionavigation service (ARNS) and the radionavigation satellite service (RNSS) (Earth-to-space);

b) the current allocation of the frequency band 5 010-5 030 MHz to the AMS(R)S subject to agreement obtained under No. **9.21**, the ARNS and the RNSS (space-to-Earth and space-space);

c) that WRC-07 has made allocations to the aeronautical mobile (R) service (AM(R)S) in the bands 5 000-5 010 MHz and 5 010-5 030 MHz limited to systems operating in accordance with recognized international aeronautical standards;

d) that the International Civil Aviation Organization (ICAO) is in the process of identifying the technical and operating characteristics of new systems operating in the AM(R)S in the bands 5 000-5 010 MHz and 5 010-5 030 MHz;

e) that compatibility between systems operating in accordance with international aeronautical standards will be ensured by ICAO,

recognizing

a) that ICAO publishes recognized international aeronautical standards for AM(R)S;

b) that preliminary studies have been conducted within the ITU-R concerning the sharing and compatibility of surface based AM(R)S systems with planned RNSS systems in the 5 000-5 010 MHz and 5 010-5 030 MHz bands, and compatibility with the radio astronomy service operating in the band 4 990-5 000 MHz;

c) that system characteristics for RNSS and AM(R)S systems planned for the 5 000-5 010 MHz and 5 010-5 030 MHz bands are still evolving;

d) that technical characteristics for the RNSS have not been established by ITU-R;

e) that the RNSS needs access to the bands 5 000-5 010 MHz for feeder-links and 5 010-5 030 MHz for both service and feeder-links in the longer term;

f) that spectrum efficiency is enhanced in situations where new applications can be implemented compatibly in heavily occupied bands, *noting*

that currently only preliminary guidelines are available for the AM(R)S to ensure protection of the RNSS,

resolves

1 that stations in the AM(R)S operating in the 5 000-5 010 MHz or 5 010-5 030 MHz bands shall operate in accordance with ICAO Standards and Recommended Practices (SARPs);

2 that stations in the AM(R)S shall be restricted as necessary to ensure they do not cause harmful interference to, nor claim protection from, and shall not impose constraints on the operation and planned development of stations in the RNSS operating in the 5 000-5 010 MHz or 5 010-5 030 MHz bands;

3 that AM(R)S use in both bands shall be limited to surface applications at airports;

4 to recommend that WRC-11 review the results of the studies in *invites ITU-R* and take appropriate action,

invites ITU-R

to study the technical and operational issues relating to the compatibility between the RNSS and the AM(R)S in the bands 5 000-5 010 MHz and 5 010-5 030 MHz,

invites

1 administrations and ICAO to supply technical and operational characteristics for the AM(R)S necessary for compatibility studies, and to participate actively in the studies;

2 administrations to supply technical and operational characteristics and protection criteria for the RNSS necessary for compatibility studies, and to participate actively in the studies,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

1/1.6/6.4 Method 4 – AM(R)S allocation in the band 5 030-5 150 MHz

MOD

4 800-5 570 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
5 030-5 150	AERONAUTICAL RADIONAVIGATION 5.367 5.444 5.444A <u>ADD 5.AM2</u>	
...		

ADD

5.AM2 The band 5 091-5 150 MHz is also allocated to the aeronautical mobile (R) service on a primary basis, limited to surface applications at airports by systems operating in accordance with recognized international aeronautical standards. Such use shall be in accordance with Resolution **[AM(R)S-5 GHz] (WRC-07)**.

ADD

RESOLUTION [AM(R)S-5 GHz] (WRC-07)

Compatibility between the aeronautical mobile (R) service and fixed-satellite service (Earth-to-space) in the band 5 091-5 150 MHz

The World Radiocommunication Conference (Geneva, 2007),

considering

a) the allocation of the 5 091-5 150 MHz band to the fixed-satellite (FSS) (Earth-to-space) limited to feeder links of non-geostationary-satellite (non-GSO) systems in the mobile-satellite service (MSS);

b) the current allocation of the frequency band 5 000-5 150 MHz to the aeronautical mobile satellite (R) service (AMS(R)S) subject to agreement obtained under No. **9.21** and the aeronautical radionavigation service (ARNS);

c) this Conference has allocated the 5 091-5 150 MHz band for the aeronautical mobile (R) service (AM(R)S) limited to systems operating in accordance with recognized international aeronautical standards;

d) this Conference has allocated the 5 091-5 150 MHz band to the aeronautical mobile service (AMS) limited to secure and confidential radiocommunications between aircraft and ground intended for systems used in response to unlawful interruption of aircraft operations;

e) that the International Civil Aviation Organization (ICAO) is in the process of identifying the technical and operating characteristics of new systems operating in the AM(R)S in the band 5 091-5 150 MHz;

f) that one AM(R)S system, to be used by aircraft operating on the airport surface, has demonstrated compatibility with the FSS in the 5 091-5 150 MHz band;

g) that ITU-R studies have examined potential sharing among AMS applications and have shown that the aggregate interference from aeronautical security, aeronautical telemetry and AM(R)S should total no more than 3% $\Delta T_s/T_s$,

recognizing

a) that precedence is to be given to the microwave landing system (MLS) in accordance with No. **5.444** in the frequency band 5 030-5 150 MHz;

b) that ICAO publishes recognized international aeronautical standards for AM(R)S systems, *noting*

a) that the number of FSS transmitting stations required may be limited;

b) that the use of the band 5 091-5 150 MHz by the AM(R)S needs to ensure protection of the current or planned use of this band by the FSS (Earth-to-space);

c) that ITU-R studies describe methods for ensuring compatibility between the AM(R)S and FSS operating in the band 5 091-5 150 MHz, and compatibility has been demonstrated for the AM(R)S system referenced in *considering f)*,

resolves

1 that administrations, in making assignments, shall ensure that stations in the AM(R)S operate in accordance with ICAO Standards and Recommended Practices (SARPs);

2 that the coordination distance with respect to stations in the FSS operating in the band 5 091-5 150 MHz shall be based on ensuring that the received signal at the AM(R)S station from the FSS transmission does not exceed −143 dB(W/MHz), where the required basic transmission loss shall be determined using the methods described in Recommendations ITU-R P.525-2 and ITU-R P.526-9;

3 that studies of the band 5 091-5 150 MHz be undertaken by ITU-R regarding the apportioning of the FSS 3% $\Delta T_s/T_s$ aggregate interference limit between new AMS allocated at this Conference, with the task of developing or revising Recommendation ITU-R M.[AM(R)S/AS 5 091-5 150 MHz] to ensure that aggregate limit is not exceeded;

4 that until the studies in *resolves* 3 are completed, a provisional limit for the AM(R)S of less than *xx*%[1] $\Delta T_s/T_s$ shall be applied. This value will be reviewed at a future conference preferably WRC-11,

invites

1 administrations and ICAO to supply technical and operational criteria necessary for sharing studies for the aeronautical mobile (R) service, and to participate actively in such studies;

2 ICAO to take into account the limit given in *resolves* [4] when developing SARPS for AM(R)S systems operating in the band 5 091-5 150 MHz,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

[1] *xx* equals 2% if the Conference allocates aeronautical mobile telemetry, and 3% otherwise.

1/1.6/6.5 Method 5 – AMS allocation limited to aeronautical security applications in the band 5 091-5 150 MHz

MOD

5 030-5 150 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
5 030-5 150	AERONAUTICAL RADIONAVIGATION 5.367 5.444 5.444A ADD 5.XAS	

ADD

5.XAS *Additional allocation:* The band 5 091-5 150 MHz is also allocated to the aeronautical mobile service, on a primary basis, in accordance with Resolution **[AMS(AS) 5 GHz] (WRC-07)**.

ADD

RESOLUTION [AMS(AS) 5 GHz] (WRC-07)

Considerations for sharing the band 5 091 -5 150 MHz by the aeronautical mobile service for aeronautical security applications and fixed-satellite service

The World Radiocommunication Conference (Geneva, 2007),

considering

a) the current allocation of the 5 091-5 150 MHz band to the fixed-satellite (FSS) (Earth-to-space), which is limited to feeder links of non-geostationary-satellite (non-GSO) systems in the mobile-satellite service (MSS) services;

b) the current allocation of the frequency band 5 000-5 150 MHz to the aeronautical mobile satellite (R) service (AMS(R)S) subject to agreement obtained under No. **9.21** and the aeronautical radionavigation service (ARNS);

c) this Conference has allocated the 5 091-5 150 MHz band for the aeronautical mobile (R) service (AM(R)S);

d) this Conference has also allocated the 5 091-5 150 MHz band for the aeronautical mobile service (AMS) limited to secure and confidential radiocommunications between aircraft and ground intended for systems used in response to unlawful interruption of aircraft operations,

recognizing

a) that precedence is to be given to the microwave landing system (MLS) in accordance with No. **5.444** in the frequency band 5 030-5 150 MHz;

b) that Resolution **114 (WRC-03)** applies to the sharing conditions between the FSS and ARNS in the 5 091-5 150 MHz band;

c) that Resolution **[AM(R)S-5 GHz] (WRC-07)** provides guidance on the use of the band 5 091-5 150 MHz by the AMS,

noting

that ITU-R studies describe methods for ensuring compatibility between the AMS for aeronautical security applications and FSS operating in the band 5 091-5 150 MHz,

resolves

1 that the AMS is limited to stations providing secure and confidential radiocommunications intended for systems used in response to unlawful interruption of aircraft operations;

2 that studies of the band 5 091-5 150 MHz be undertaken by the ITU-R regarding the apportioning of the FSS 3% $\Delta T_s/T_s$ aggregate interference limit between new AMS allocated at this Conference, with the task of developing or revising Recommendation ITU-R M.[AM(R)S/AS 5 091-5 150 MHz] to ensure that aggregate limit is not exceeded;

3 that until the studies in *resolves* 2 are completed, stations in the AMS, limited to aeronautical security applications, shall be designed in such a manner that the transmitter power flux-density be limited to –140.25 dB(W/(m^2 · 1.23 MHz)) at an FSS satellite using full Earth coverage receive antennas with an orbit of 1 414 km. This value will be reviewed at a future Conference preferably WRC-11;

4 that the conditions of *resolves* 1 and 3 do not apply to the AM(R)S in RR **ADD** No. **5.AM2**;

5 that administrations, in making assignments, shall ensure that the requirements for the AM(R)S take precedence over those of the AMS for security applications.

Note 1 – If an allocation to the AMS limited to aeronautical telemetry is made under Agenda item 1.5, the provisions of resolves 4 will need to be revised.

CHAPTER 2

SPACE SCIENCE SERVICES

(Agenda items 1.2, 1.20 and 1.21)

CONTENTS

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Agenda item 1.2*

"to consider allocations and regulatory issues related to the Earth exploration-satellite (passive) service, space research (passive) service and the meteorological-satellite service in accordance with Resolutions 746 (WRC-03) and 742 (WRC-03)"

Executive summary

Agenda item 1.2 covers 3 issues.

Issue A addresses the extension of the current allocation to the meteorological-satellite service in the band 18.1-18.3 GHz by an additional 100 MHz to support increased data rate requirements originating from high-resolution sensors. The sub-bands 18.0-18.1 GHz and 18.3-18.4 GHz have been investigated regarding compatibility with other affected services. Three methods are proposed:

1) an extension to the 18.0-18.1 GHz band,

2) an extension to the 18.0-18.1 GHz band with no protection for meteorological-satellite service from the broadcasting-satellite service and no restrictions on broadcasting-satellite service feeder-link earth stations, and

3) an extension to the 18.3-18.4 GHz band.

Issue B addresses sharing between the Earth exploration-satellite service (passive) and space research service (passive) and the fixed service and mobile service in the band 10.6-10.68 GHz. Sharing scenarios have been analysed and mitigation techniques have been identified, leading to possible technical limits to allow sharing. Three methods are proposed:

1) introduction of single entry emission limits into the RR,

2) use of current limits in the RR with additional constraints, and

3) encouragement of administrations to apply the constraints and techniques specified in the appropriate Recommendations.

Issue C addresses sharing between Earth exploration-satellite service (passive) and space research service (passive) and the fixed service and mobile service in the band 36-37 GHz. Sharing scenarios have been analysed and mitigation techniques have been identified, leading to possible technical limits to allow sharing. Two methods are proposed:

1) introduction of single entry emission limits into the RR, and

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* The Administrations of Algeria, Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Mauritania, Oman, Qatar, Syrian Arab Republic and Tunisia **object** to any regulatory solution imposing hard limits on the use of FS and MS in the band 10.6-10.68 GHz and on proposing the use of the band 18.0-18.1 GHz.

2) encouragement of administrations to apply the constraints and techniques specified in the appropriate Recommendations.

Resolution 746 (WRC-03) – Issues dealing with allocations to science services

2/1.2/1 **Issue A –** Resolution **746 (WRC-03)** *resolves*

"1 to invite ITU-R to conduct sharing analyses between geostationary meteorological satellites operating in the space-to-Earth direction and the fixed, fixed-satellite and mobile services in the band 18-18.4 GHz to define appropriate sharing criteria with a view to extending the current 18.1-18.3 GHz geostationary meteorological satellites allocation in the space-to-Earth direction to 300 MHz of contiguous spectrum"

2/1.2/1.1 Background

An expansion of the current meteorological-satellite service (MetSat) allocation is desirable as the next-generation geostationary MetSat systems are expected to have bandwidth requirements up to 300 MHz. This is primarily due to transmission of high rate data from high-resolution sensors. Frequencies around 18 GHz are suitable for transmission of this high rate data considering, in particular, that a primary allocation to the geostationary MetSat (space-to-Earth) exists already in the band 18.1-18.3 GHz based on RR No. **5.519**.

2/1.2/1.2 Summary of technical and operational studies and relevant ITU-R Recommendations

Two bands, 18.0-18.1 GHz and 18.3-18.4 GHz, were studied for the extension of the current allocation for geostationary MetSat in footnote RR No. **5.519**. The overall results of the compatibility analyses are summarized in the following sections.

2/1.2/1.2.1 Sharing between GSO MetSat (space-to-Earth) systems and GSO FSS (space to-Earth) systems

Relevant ITU-R Recommendations: ITU-R S.580-6, ITU-R S.1328-4, DNR ITU-R SA.[MET 18 GHz].

MetSat and fixed-satellite service (FSS) operation in the 18.0-18.4 GHz band are subject to the procedures effecting coordination in RR Article **9** (RR No. **9.7**). The geostationary-satellite orbit (GSO) FSS earth station single entry coordination trigger is 6% $\Delta T/T$ and is found in RR Appendix **5**. Compatibility studies of co-frequency co-coverage interference between MetSat and FSS examined two cases, a general case and a specific case using information from Recommendation ITU-R S.1328-4 (including systems operating up to 19.7 GHz). The required angular separation was calculated to be less than 2° for most typical co-frequency co-coverage cases and less than 5° to meet a 6% $\Delta T/T$ criterion. With earth stations outside antenna main lobe in either case the required angular separation between the satellites is fractions of a degree. Detailed results of the studies can be found in Annex 2 to the Working Party 7B Chairman's Report (Document 7B/151).

Taking into account FSS system characteristics based on Recommendation ITU-R S.1328-4, the design for next-generation MetSat systems has been optimized to maximize the level of homogeneity between FSS and MetSat systems. Obviously, this will not only result in maximum compatibility but also facilitate any coordination procedures at a later stage. Therefore, the required separation distances resulting from this study are essentially the same as would be obtained for compatibility between two GSO FSS systems.

2/1.2/1.2.2 Sharing between GSO MetSat (space-to-Earth) systems and BSS feeder links (Earth-to-space)

Relevant ITU-R Recommendations: ITU-R P.452-12, ITU-R P.526-9, ITU-R S.580-6, ITU-R P.833-5, DNR ITU-R SA.[MET 18 GHz].

Typical separation distances in reverse band sharing situations between receiving MetSat earth stations and transmitting broadcasting-satellite service (BSS) feeder uplinks are limited to the first line of sight obstacle. In the worst case, around 40 km separation is necessary. International coordination will therefore rarely be required. An angular separation of 1° between a GSO MetSat satellite transmitting in the 18.0-18.1 GHz band and a satellite receiving a BSS feeder link in this band results in an I/N ranging between −40 dB in a worst case and −44 dB in a typical case. With a typical equivalent isotropically radiated power (e.i.r.p.) of a MetSat satellite, a 0.1° orbital separation results in an I/N of −24 dB, corresponding to a $\Delta T/T$ of 0.4%.

2/1.2/1.2.3 Sharing between GSO MetSat (space-to-Earth) systems and non-GSO FSS (space-to-Earth) systems

Relevant ITU-R Recommendations: ITU-R S.580-6, ITU-R S.1328-4, DNR ITU-R SA.[MET 18 GHz].

Two types of non-GSO FSS systems were involved in these compatibility studies; systems with large receive earth station antennas (~70 dBi maximum gain) and those with smaller receive earth station antennas (~46 dBi maximum gain). In all cases, margins between 9 and 50 dB were available. Detailed results of the studies can be found in Annex 2 to the Working Party 7B Chairman’s Report (Document 7B/151). Coordination is not required between non-GSO FSS systems and GSO MetSat networks. Non-GSO FSS (space-to-Earth) systems are subject to the equivalent power flux-density (epfd↓) limits of RR No. **22.5C**. Meeting these limits fulfils the obligation under RR No. **22.2** to ensure non-GSO FSS systems do not cause unacceptable interference to GSO FSS and BSS systems. These limits effectively provide protection to the MetSat networks from non-GSO FSS systems since the MetSat allocation is for GSO satellites.

2/1.2/1.2.4 Sharing between GSO MetSat (space-to-Earth) systems and the fixed service (point-to-point and point-to-multipoint) systems

Relevant ITU-R Recommendations: ITU-R P.526-9, ITU-R S.580-6, ITU-R F.699-7, ITU-R F.758-4, ITU-R P.833-5, ITU-R F.1107-1.

Sharing with fixed service (FS) point-to-point (P-P) and point-to-multipoint (P-MP) systems is already possible with respect to GSO MetSat systems in the 18.1-18.3 GHz band considering that the currently applicable power flux-density (pfd) limits as given in RR Table **21-4** for the MetSat can be respected with significant margin. Extending the current MetSat allocation by 100 MHz will not change this situation. Detailed results of the studies can be found in Annex 2 to the Working Party 7B Chairman's Report (Document 7B/151).

2/1.2/1.2.5 Sharing between GSO MetSat (space-to-Earth) systems and the mobile service

No sharing studies were performed since there is no current use of the band by the MS. There are no known plans to use this band by the MS in the foreseeable future.

2/1.2/1.3 Analysis of the results of studies

2/1.2/1.3.1 Sharing between GSO MetSat (space-to-Earth) systems and GSO FSS (space-to-Earth) systems

Based on the compatibility study results, application of the ±8° coordination arc that currently applies to the case of FSS-to-FSS coordination in the 18 GHz band to the case of FSS-to-MetSat coordination across the entire 300 MHz of spectrum identified for MetSat operations would be appropriate. In addition to the overall results of the technical studies, it must be noted from a practical standpoint that in Region 2, the 18.3-18.4 GHz band has been identified for use by high-density applications in the fixed-satellite service (HDFSS) systems under RR No. **5.516B** and this is expected to lead to increasing commercial use of this band. Despite the fact that sharing is feasible, the increased use by FSS systems communicating with large numbers of ubiquitously deployed small earth stations will complicate Region 2 MetSat coordination with the FSS in the band 18.3-18.4 GHz.

2/1.2/1.3.2 Sharing between GSO MetSat (space-to-Earth) systems and BSS feeder links (Earth-to-space)

In Regions 1 and 3, the 18.0-18.1 GHz band segment, apart from being used for FSS downlinks, is part of RR Appendix **30A** (see RR No. **5.516**) which will not be constrained by this new MetSat allocation. Considering, however, the small number of MetSat satellites to be deployed, proper choice of orbital location, as stated in § 2/1.2/1.2.2, will ensure continued protection of satellites operating under RR Appendix **30A**. Considering also the small number of MetSat earth stations and BSS feeder link earth stations for which in the worst case a geographical separation of 40 km is required, careful selection of the location of MetSat earth stations in particular countries could eliminate the need to coordinate with feeder link stations of BSS satellite networks in neighbouring countries. This would ensure continued protection of BSS feeder links operating under RR Appendix **30A**.

2/1.2/1.3.3 Sharing between GSO MetSat (space-to-Earth) systems and non-GSO FSS (space-to-Earth) systems

Results of the compatibility analyses between non-GSO FSS systems with characteristics contained in Recommendation ITU-R S.1328-4 and next-generation MetSat systems conclude that no harmful interference is caused by MetSat satellites transmitting a worst-case e.i.r.p. towards co-located earth stations of the MetSat and the non-GSO FSS. Even under these worst-case assumptions the required non-GSO-FSS protection levels can be met with large margins. With regard to the potential of interference from non-GSO-FSS satellites into a MetSat earth station significant margin will be available to co-located non-GSO FSS earth stations with small antennas. No issues are anticipated given the expected small number of MetSat earth stations and non-GSO-FSS earth stations with large antennas.

2/1.2/1.3.4 Sharing between GSO MetSat (space-to-Earth) systems and fixed service (point-to-point and point-to-multipoint) systems

Currently applicable power flux density limits as given in RR Table **21-4** for the MetSat in the band 18.1-18.3 GHz to protect the FS can be respected with significant margin.

Therefore, sharing with FS P-P and P-MP systems in the MetSat expansion band will be possible by applying the same power flux density limits as given in RR Table **21-4** and due to the recognition that the number of MetSat satellites to be operated in this band would be quite limited (five to ten on a global basis), that the number of earth stations deployed to support these MetSat systems will be of the same order as the number of satellites, and that the antennas of these supporting earth stations would be relatively large (on the order of 6-10 m in diameter). Sharing between FS P-P and P-MP systems and MetSat earth stations under line-of-sight conditions is feasible with an angular off-pointing of typically around 2-2.5° and a separation distance of typically 4-9 km. Given the small number of GSO MetSat systems and the corresponding earth stations, careful selection of the location of MetSat earth stations should easily facilitate coordination with FS stations.

2/1.2/2 Issue B – Resolution 746 (WRC-03) *resolves*

"2 to invite ITU-R to conduct sharing analyses between the EESS (passive) and the space research service (passive) on one hand and the fixed and mobile services on the other hand in the band 10.6-10.68 GHz to determine appropriate sharing criteria"

2/1.2/2.1 Background

The band 10.6-10.68 GHz is allocated to the Earth exploration-satellite service (EESS) (passive), and the radio astronomy and space research service (SRS) (passive), on a primary basis. The 10.6-10.68 GHz band is also allocated to the FS and the MS on a primary basis. RR No. **5.482** limits the e.i.r.p. of FS and MS stations in this band to 40 dBW and the transmitter power to −3 dBW, except in the 30 countries listed in this footnote. The World Administrative Radio Conference in 1979 allocated this band to the EESS (passive) on a co-equal basis with the then existing FS and MS services.

The band 10.6-10.68 GHz is currently used by the FS for P-P and P-MP systems. This band is also used for occasional temporary P-P video links (including electronic news gathering, television outside broadcast and electronic field production), which may be considered as part of the MS.

The provisions given in RR No. **5.482** may not be sufficient to ensure the protection of the EESS (passive) in the band 10.6-10.68 GHz, therefore sharing criteria between the EESS (passive) and the SRS (passive) and the other primary services need to be defined.

The band 10.6-10.7 GHz is of primary interest to the EESS (passive) to measure rain, snow, sea state and ocean wind for ocean and land surfaces. This frequency band is considered as an all-weather region suitable for using multi-spectral systems to establish surface material properties. The data derived from these measurements are also used for natural disaster prediction.

A number of EESS (passive) sensors are already using this frequency band for such measurements, and additional sensors are planned in the near future. These measurements are fully operational (regular use of the data, continuity of service, several usable data products) and are used on a worldwide basis. The retrieved data are part of a set of measurements performed at five interrelated frequencies (6, 10, 18, 24 and 36 GHz) that are used and exchanged between the meteorological organizations in all regions.

2/1.2/2.2 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant ITU-R Recommendations: ITU-R RS.515-4, ITU-R RS.1028-2, ITU-R RS.1029-2, ITU-R F.758-4, ITU-R F.1568-1, DNR ITU-R RS.[10/36 GHz MITIGATE], Working Document towards** PDNR ITU-R F.[9D/219 Annex 6][Annex 6 to the Working Party 9D Chairman's Report, Document 9D/219].

Relevant ITU-R Reports: Report ITU-R RS.2096 and Working Document toward PDN Report ITU-R F.[10 GHz EESS-FS][Annex 9 to the Working Party 9D Chairman's Report, Document 9D/219].

Sharing studies were conducted using FS parameters for P-P and P-MP systems provided in Recommendation ITU-R F.758-4 and by administrations in contributions to the ITU-R performing the sharing studies.

** Reference to the Working Document was necessary in the RR **ADD 5.XXX** in § 2/1.2/5.2, to be further developed, however Recommendation will only be referenced if it is approved before WRC-07.

The P-P FS deployment models used in most of the compatibility studies in this band assumed that FS systems are predominantly deployed in urban and sub-urban areas, with few if any systems in rural areas. For the P-MP systems addressed in these studies, two such systems per city were assumed for interference simulations based on the Recommendation ITU-R F.1568-1 channel arrangements. In addition, studies were performed using publicly available information on the FS facilities currently licensed in two countries for comparison of results with those obtained using those theoretical FS P-P deployment models.

As for MS systems, sharing studies were conducted using technical and operational parameters for MS systems provided by administrations. The characteristics of such MS stations are very similar to the FS station characteristics assumed in the dynamic simulations, except that the range of elevation angles in the MS is likely to be greater than that of the FS and non-directional antennas may be used in the MS. The MS deployment models used in the sharing studies in this band assumed that MS systems are distributed in proportion to the population of each region in the measurement area, and that the deployment density and the activity factor are based on operational data.

Sharing studies were conducted using dynamic model simulations. These simulations developed cumulative distribution functions (CDFs) of received interference levels from various FS and MS deployment models over a 10 million square kilometre measurement area for comparison with the criteria of Recommendation ITU-R RS.1029-2. Simulations were also conducted to determine the effectiveness of controlling certain technical and operational characteristics of EESS (passive) and FS and MS stations operating in this band in mitigating interference levels. These factors include passive sensor off-nadir pointing angles and sensor antenna patterns, FS elevation angles and FS and MS power settings.

2/1.2/2.3 Analysis of the results of studies

The interference levels resulting from the studies described above exceed the permissible interference criteria of Recommendation ITU-R RS.1029-2 of −156 dB(W/100 MHz) for current passive sensors by 5 to 25 dB over 0.1% of a passive sensor measurement area depending on the FS station deployment density. Other simulations using the parameters of the currently licensed FS stations in two countries indicate that the permissible interference criteria for current passive sensors may be exceeded by about 17 dB over 0.1% of the area in those countries. Recent examination of passive sensor measurements have provided evidence of corrupted measurement data due to interference exceeding the Recommendation ITU-R RS.1029-2 criteria consistent with these simulation results over several administrations, although one administration indicates that no MS or FS stations were operating in this band in its territory[1].

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[1] This administration is currently investigating the cause of the interference. The studies are still ongoing and the results of these studies are not yet known.

Sharing studies between EESS (passive) and MS stations were also conducted and the interference level exceeds the permissible interference criteria for current passive sensors by 14 dB. In this sharing study, the effect of activity factor of MS stations was included.

Recommendation ITU-R RS.1029-2 specifies permissible interference levels for the EESS (passive) that should be used in interference assessment or sharing studies, and not the sharing conditions to be specified in regulatory provisions governing the sharing of this band by the EESS (passive) and the FS and MS. In developing any regulatory sharing criteria between the EESS (passive) and other services, the impact of compliance on the FS and MS and the impact of exceeding these interference levels on the EESS (passive) should be taken into account.

A number of technical and operational characteristics of EESS (passive) sensors and FS and MS systems were considered and evaluated as possible approaches to mitigate or minimize the level of interference. Table 1.2-1 identifies possible limits on the technical and operational characteristics of these systems. It should be noted that in developing this table, it was difficult to specify limits that struck the proper balance between avoiding undue constraints on the active services while providing adequate protection of the EESS (passive) with certainty.

Each of the individual entries in this table, such as maximum power, is based on simulations that assume that no mitigation techniques are applied by the active service unless specified in the table. The limits indicated in the table may be relaxed if multiple sharing criteria or mitigation techniques are applied simultaneously. Possible mitigation techniques include flexible power setting, automatic transmitter power control (ATPC) to mitigate fading, and use of high-performance directional antennas. In some cases the mitigation techniques might not be applicable, e.g. ATPC for one-way applications like broadcasting auxiliary service (BAS) or large antenna size in regions where severe meteorological conditions (for example typhoons) occur. The interference levels to EESS (passive) indicated by the results of simulation studies using the values indicated in this table exceed the permissible interference criteria of Recommendation ITU-R RS.1029-2 for some of the deployment models considered in the sharing studies. Nevertheless, such a result is considered acceptable for EESS (passive) systems in view of the need to find an equitable burden sharing in establishing sharing criteria for the services sharing this band.

TABLE 1.2-1

Possible sharing criteria in the band 10.6-10.68 GHz

EESS (passive)	FS	MS
Incidence angle ≤ 60°, where the incidence angle is defined as the angle at the Earth's surface between the local vertical and the centre of the passive sensor antenna beam	Elevation angle ≤ 20°	
Spatial resolution ≤ 50 km, where the spatial resolution is defined as the maximum cross-section of the passive sensor −3 dB contour on the Earth's surface	Maximum P-P transmitter power: ≤ −15 dBW In case ATPC is used, this power limit can be increased by a value corresponding to the ATPC range, up to a maximum of –3 dBW. Maximum P-MP transmitter power: ≤ −17 dBW hub stations ≤ −10 dBW customer stations	Maximum transmitter power ≤ −17 dBW
Main beam efficiency ≥ 85%, where the main beam efficiency is defined as the energy (main and cross-polarization components) within 2.5 times the −3 dB beamwidth region, relative to the total energy within all angles	Maximum P-MP hub station e.i.r.p. ≤ −4 dBW	

Resolution 742 (WRC-03) – Use of the frequency band 36-37 GHz

2/1.2/3 **Issue C –** Resolution **742 (WRC-03)** *resolves*

"1 to invite ITU-R to conduct sharing studies between the passive services and the fixed and mobile services in the band 36-37 GHz in order to define appropriate sharing criteria"

2/1.2/3.1 Background

The band 36-37 GHz is allocated to the EESS (passive) and SRS (passive), and to the FS and MS, all on a primary basis. EESS (passive) and SRS (passive) operating in this band could receive interference from the emissions of systems of active services. Therefore, sharing criteria between the passive services and the active services need to be defined for the band 36-37 GHz. The World Administrative Radio Conference in 1979 allocated this band to the EESS (passive) on a co-equal basis with the FS and MS services.

The band 36-37 GHz is of primary interest to the EESS (passive) to measure rain, snow, ocean ice and water vapour. This band is also called a window. This band is essential for the precise knowledge of the hydrological cycle or global water circulation, and has been used for the last 20 years for climatological studies of snow, sea ice, soil moisture, microwave vegetation index and land surface temperature. The main parameters that are measured over the ocean surfaces are: salinity, wind speed, liquid clouds, water vapour and sea surface temperature. Over land surfaces, the retrieved parameters are: vegetation biomass, cloud liquid water, integrated water vapour, soil moisture and surface roughness. The data derived from these measurements are also used for natural disaster prediction.

A number of EESS (passive) sensors are already using this frequency band for such measurements, and additional sensors are planned in the near future. These measurements are fully operational (regular use of the data, continuity of service, several usable data products) and are used on a worldwide basis. The retrieved data are part of a set of measurements performed at five interrelated frequencies (6, 10, 18, 24 and 36 GHz) that are used and exchanged between the meteorological organizations on a worldwide basis.

2/1.2/3.2 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant ITU-R Recommendations: ITU-R RS.515-4, ITU-R RS.1028-2, ITU-R RS.1029-2, ITU-R F.758-4, DNR ITU-R RS.[10/36 GHz MITIGATE].

Relevant ITU-R Reports: Report ITU-R RS.2095 and Working Document toward PDN Report ITU-R F.[36 GHz EESS-FS][Annex 8 to the Working Party 9D Chairman’s Report, Document 9D/219].

Recommendation ITU-R F.758-4 lists various P-P and P-MP FS system parameters for frequency sharing studies. With respect to P-MP systems in the 36-37 GHz band, Table 31 of that Recommendation provides representative characteristics for the 30-40 GHz range, but no specific system characteristics are listed for the 36-37 GHz band. Parameters of FS systems were submitted by administrations for use in sharing studies, although few administrations indicated any current use of the band.

Although FS systems in this band are likely to be predominantly deployed in urban and suburban areas, with few if any systems in rural areas, very limited use is currently being made of this band.

Concerning MS systems, sharing studies were conducted using the technical and operational parameters of MS systems provided by administrations. The MS deployment model used in the sharing studies in this band assumed that MS systems are distributed in proportion to the population of each region in the measurement area, and that the deployment density and the activity factor are based on operational data.

Sharing studies were conducted using dynamic model simulations. These simulations developed CDFs of received interference levels from various FS and MS deployment models over a 10 million square kilometre measurement area for comparison with the criteria of Recommendation ITU-R RS.1029-2. Simulations were also conducted to determine the effectiveness of controlling certain technical and operational characteristics of EESS (passive) and FS and MS stations operating in this band in mitigating interference levels.

2/1.2/3.3 Analysis of the results of studies

The studies described above indicate that compatibility between FS operations with their current parameters and the EESS (passive) sensors currently operating in this band can be achieved if deployment densities are sufficiently low. Sharing criteria based on these current FS parameters would therefore not pose an undue burden on the FS.

Sharing studies between the EESS (passive) and the MS were also conducted and the interference level does not exceed the permissible interference criteria for current and future passive sensors. In the sharing study, the effect of the activity factor of MS stations was included.

A number of technical and operational characteristics of EESS (passive) sensors and FS and MS systems were considered and evaluated as possible approaches to mitigate or minimize the level of interference. Table 1.2-2 identifies possible limits on the technical and operational characteristics of these systems that can facilitate the sharing of the 36-37 GHz band between EESS (passive) and the FS and MS.

TABLE 1.2-2

Possible sharing criteria in the band 36-37 GHz

EESS (passive)	FS	MS
Incidence angle ≤ 60°, where the incidence angle is defined as the angle at the Earth's surface between the local vertical and the centre of the passive sensor antenna beam	Elevation angle range ≤ 20°	
Spatial resolution ≤ 50 km, where the spatial resolution is defined as the maximum cross-section of the passive sensor –3 dB contour on the Earth's surface	Maximum P-P transmitter power ≤ –10 dBW (Note 1) Maximum P-MP transmitter power: ≤ –5 dBW hub stations ≤ –10 dBW customer stations	Maximum transmitter power ≤ −10 dBW Maximum transmitter power ≤ –3 dBW (if activity factor less than 40%)
Main beam efficiency ≥ 92%, where the main beam efficiency is defined as the energy (main and cross-polarization components) within 2.5 times the –3 dB beamwidth region, relative to the total energy within all angles	Maximum P-MP hub station e.i.r.p. ≤ +12 dBW	

NOTE 1 – In the case of FS P-P systems using ATPC, the maximum transmitter power may be increased by a value corresponding to the ATPC range up to a maximum of –7 dBW.

Each of the individual entries in this table, such as maximum power, is based on simulations that assume that no mitigation techniques are applied by the active service. The limits indicated in the table may be relaxed if multiple sharing criteria or mitigation techniques are applied simultaneously. Possible mitigation techniques include flexible power setting, ATPC to mitigate fading, and use of high performance directional antennas. The interference levels to EESS (passive) indicated by the results of simulation studies using the values indicated in this table exceed the permissible interference criteria of Recommendation ITU-R RS.1029-2 for some of the deployment models considered in the sharing studies. Nevertheless, such a result is considered acceptable for EESS (passive) systems in view of the need to find an equitable burden sharing in establishing sharing criteria for the services sharing this band.

2/1.2/4 Methods to satisfy the agenda item

2/1.2/4.1 Methods to satisfy Issue A

2/1.2/4.1.1 Method A1

Method A1 is to add an allocation to the MetSat in the band 18.0-18.1 GHz on a worldwide basis through the modification of RR No. **5.519** to be applicable to the frequency band 18.0-18.3 GHz.

Advantages:

– Provision of adequate frequency spectrum to satisfy the requirements of next-generation GSO MetSat systems.

Disadvantages:

– In Regions 1 and 3, some minor constraints could be imposed on the choice of the orbital position for the MetSat systems as well as on the location of their corresponding earth stations to protect operation of BSS feeder links.

2/1.2/4.1.2 Method A2

Method A2 is to add an allocation to the MetSat in the band 18.0-18.1 GHz on a worldwide basis with an additional new footnote stating that in the band 18.0-18.1 GHz, earth stations of the MetSat (space-to-Earth) in Region 1 and 3 shall not claim protection from the BSS feeder-link earth stations operating under RR Appendix **30A**, nor put any limitations or restrictions on the locations of the BSS feeder-link earth stations anywhere within the service area of the feeder link.

Advantages:

– Provision would ensure that MetSat receive stations could not affect the RR Appendix **30A** Plan.

Disadvantages:

– In Regions 1 and 3, MetSat systems would have to operate under a secondary status with respect to BSS feeder links.

2/1.2/4.1.3 Method A3

Addition of an allocation to the MetSat in the band 18.3-18.4 GHz on a worldwide basis. This could be accomplished through the modification of RR No. **5.519** to be applicable to the frequency band 18.1-18.4 GHz. The same objective could be accomplished by adding the MetSat directly to the Table in RR Article **5**.

Advantages:

– Provision of adequate frequency spectrum to satisfy the requirements of next-generation GSO MetSat systems.

Disadvantages:

– The identification of the band 18.3-18.4 GHz for use by HDFSS systems under RR No. **5.516B** in Region 2 and the expected consequential increased use of this band by the FSS will make MetSat coordination with the FSS more complicated in Region 2.

2/1.2/4.2 Method to satisfy Issue B

2/1.2/4.2.1 Method B1

In this method, single entry emission limits taking into account the results of the compatibility analysis and the sharing criteria identified in Table 1.2-1 are proposed to be included in the RR. Those limits would be non-retroactive for the terrestrial active systems notified or brought into use before WRC-07 (the exact date corresponding to this concept will have to be decided by WRC-07). It is proposed that the values of the existing RR No. **5.482** be modified using the new appropriate emission limits.

Advantages:

– The EESS (passive) would be protected from in-band emissions through regulatory provisions that would be applied consistently worldwide.

Disadvantages:

– These limits may unduly constrain the operations and deployment of future active systems, especially in the case of one-way broadcast auxiliary service (BAS) systems for which certain mitigation techniques (ATPC and large antenna size) would not be applicable.

2/1.2/4.2.2 Method B2

In this method, propose limits based on the current limits in RR No. **5.482** together with additional constraints on the active services that can be implemented without significant impact on them. Those limits should be non-retroactive for the FS and MS systems which are notified or brought into use before WRC-07 (the exact date corresponding to this concept will have to be decided by WRC-07).

For the FS

– maximum transmitter power ≤ −3 dBW

– elevation angle range ≤ 20°

For the MS

– maximum transmitter power ≤ −3 dBW

– maximum e.i.r.p. ≤ 32 dBW

Advantages:

– The proposed values would not impose any significant constraints on the FS and MS.

– Transmitter power up to −3 dBW will support current configurations of active service systems, even under fading conditions.

Disadvantages:

– Protection for the EESS (passive) would not be provided.

– EESS (passive) measurement data will be lost over increasing portions of the Earth's surface if the deployment density of the active service systems increases in the future under these conditions.

– There is the risk that the band will become unusable by the EESS (passive) for global weather measurements necessary for meteorological forecasts.

2/1.2/4.2.3 Method B3

In this method, a new footnote added to RR Article **5** would encourage administrations to apply the technical constraints and mitigation techniques specified in referenced WRC or ITU-R Recommendation(s), as appropriate, to facilitate sharing of the 10.6-10.68 GHz band by the FS, MS and EESS (passive).

Advantages:

– Flexibility in applying mitigation techniques to future FS and MS facilities.

Disadvantages:

– Compliance with recommended mitigation techniques may increase costs and constrain the operations or deployment of future systems.

– EESS (passive) instruments are likely to receive increasing levels of interference in the future if the recommended technical constraints and mitigation techniques are not applied.

– Non-mandatory limits may not provide effective worldwide protection of EESS (passive) operations that are required for adequate meteorological and climatological forecasts and natural disaster predictions.

2/1.2/4.3 Methods to satisfy Issue C

2/1.2/4.3.1 Method C1

In this method, single entry emission limits taking into account the results of the compatibility analysis and the sharing criteria identified in Table 1.2-2 are proposed to be included in a footnote of RR Article **5**. Those limits would be non-retroactive for the terrestrial active systems notified or brought into use before WRC-07 (the exact date corresponding to this concept will have to be decided by WRC-07).

The advantages and disadvantages of this method are the same as Method B1.

2/1.2/4.3.2 Method C2

In this method, a new footnote added to RR Article **5** would encourage administrations to apply the technical constraints and mitigation techniques specified in referenced Recommendation(s) to facilitate sharing of the 36-37 GHz band by the FS, MS and EESS (passive).

The advantages and disadvantages of this method are the same as Method B3.

2/1.2/5 Regulatory and procedural considerations

Where appropriate, changes to the Table of Frequency Allocations in RR Article **5** will be required, consistent with each method.

2/1.2/5.1 Issue A

All methods to satisfy the agenda item require the modification of RR No. **5.519** to cover the additional frequency band to be allocated to the MetSat. This footnote already makes reference to the applicable pfd limits as contained in RR Article **21**, Table **21-4**. Consequently Table 8d (Parameters required for the determination of coordination distance for a receiving earth station) of RR Appendix **7** would need to be modified to include the specific values.

Additionally, extending the ±8° coordination arc currently applicable to FSS networks in this band, to the MetSat in the 18.0-18.3 GHz or the 18.1-18.4 GHz band is appropriate. This could be accomplished through appropriate modifications of Table 5-1 in RR Appendix **5**. This extension of the coordination arc to the MetSat allocation would reduce the workload of the Bureau in identifying affected administrations and the number of unnecessary coordinations for such systems while maintaining the rights of administrations to be included in requests for coordination involving the MetSat or FSS in this band.

Examples of the modifications of RR No. **9.41**, RR Tables 5-1 and Table 8d required to extend the coordination arc to the MetSat allocation and the coordination distance parameters for receiving earth stations are provided below.

If one of these methods is accepted, the relevant texts from Resolution **746 (WRC-03)** dealing with this issue may be deleted.

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9.41 Following receipt of the BR IFIC referring to requests for coordination under Nos. **9.7** to **9.7B**, an administration believing that it should have been included in the request or the initiating administration believing that an administration identified under No. **9.36** in accordance with the provisions of No. **9.7** (GSO/GSO) (items 1), 2)~~, and~~ 3), 4), 5) and 6) of the frequency band column), No. **9.7A** (GSO earth station/non-GSO system) or No. **9.7B** (non-GSO system/GSO earth station) of Table 5-1 of Appendix **5** should not have been included in the request, shall, within four months of the date of publication of the relevant BR IFIC, inform the initiating administration or the identified administration, as appropriate, and the Bureau, giving its technical reasons for doing so, and shall request that its name be included or that the name of the identified administration be excluded, as appropriate. (WRC-~~2000~~07)

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APPENDIX 5 (Rev.WRC-0~~3~~7)

TABLE 5-1 (*continued*) (Rev.WRC-0~~3~~7)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.7** GSO/GSO (*cont.*)		3) 17.7-20.2 GHz, (Regions 2 and 3), 17.3-20.2 GHz (Region 1) and 27.5-30 GHz	i) Bandwidth overlap, and ii) any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ± 8° of the nominal orbital position of a proposed network in the FSS		With respect to the space services listed in the threshold/condition column in the bands in 1), 2), 3), 4), 5) and ~~5~~6), an administration may request, pursuant to No. **9.41**, to be included in requests for coordination, indicating the networks for which the value of $\Delta T/T$ calculated by the method in § 2.2.1.2 and 3.2 of Appendix **8** exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix **8** shall be used
		4) 18.0-18.3 GHz or 18.1-18.4 GHz* * Note the exact frequency range will be determined by WRC-07	i) Bandwidth overlap, and ii) any network in the FSS or MetSat service and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS or MetSat service		
		~~4~~5) Bands above 17.3 GHz, except those defined in § 3) and 4)	i) Bandwidth overlap, and ii) any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS (see also Resolution **901 (WRC-03)**)		

TABLE 5-1 (*continued*) (Rev.WRC-0~~3~~7)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
		~~5~~6) Bands above 17.3 GHz	i) Bandwidth overlap, and ii) any network in the FSS or BSS, not subject to a Plan, and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±16° of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan, except in the case of a network in the FSS with respect to a network in the FSS (see also Resolution **901 (WRC-03)**)		
No. **9.7** GSO/GSO (*cont.*)		~~6~~7) All frequency bands, other than those in 1), 2), 3), 4), 5) and ~~5~~6), allocated to a space service, and the bands in 1), 2), 3), 4), 5) and ~~5~~6) where the radio service of the proposed network or affected networks is other than the space services listed in the threshold/condition column, or in the case of coordination of space stations operating in the opposite direction of transmission	i) Bandwidth overlap, and ii) Value of $\Delta T/T$ exceeds 6%	Appendix **8**	In application of Article 2A of Appendix **30** for the space operation functions using the guardbands defined in § 3.9 of Annex 5 of Appendix **30**, the threshold/condition specified for the FSS in the bands in 2) applies. In application of Article 2A of Appendix **30A** for the space operation functions using the guardbands defined in § 3.1 and 4.1 of Annex 3 of Appendix **30A**, the threshold/condition specified for the FSS in the bands in 4) applies

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APPENDIX 7 (Rev.WRC-0~~3~~7)

TABLE 8d

Parameters required for the determination of coordination distance for a receiving earth station

Receiving space radiocommunication service designation			Meteoro-logical-satellite	Fixed-satellite	Fixed-satellite [3]	Broad-casting-satellite	Earth exploration-satellite [4]	Earth exploration-satellite [5]	Space research (deep space)	Space research		Fixed-satellite [6]	Fixed-satellite [5]	Mobile-satellite	Broadcasting-satellite, fixed-satellite	Mobile-satellite	Radio-navigation	Broadcasting-satellite
										Unmanned	Manned							
Frequency bands (GHz)			~~18.1-18.3~~ 18.0-18.4 [7]	18.8-19.3	19.3-19.7	21.4-22.0	25.5-27.0	25.5-27.0	31.8-32.3	37.0-38.0		37.5-40.5	37.5-40.5	39.5-40.5	40.5-42.5	43.5-47.0	43.5-47.0	84-86
Transmitting terrestrial service designations			Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, radio-navigation	Fixed, mobile		Fixed, mobile	Fixed, mobile	Fixed, mobile	Broadcasting, fixed	Mobile	Mobile	Fixed, mobile, broadcasting
Method to be used			§ 2.1, § 2.2	§ 2.1, § 2.2	§ 2.2	§ 1.4.5	§ 2.2	§ 2.1	§ 2.1, § 2.2	§ 2.1, § 2.2		§ 2.2	§ 2.1	§ 1.4.6	§ 1.4.5, § 2.1	§ 1.4.6	–	§ 1.4.5
Modulation at earth station [1]			N	N	N		N	N	N	N		N	N	N	–	N		
Earth station interference parameters and criteria	p_0 (%)		0.05	0.003	0.01		0.25	0.25	0.001	0.1	0.001	0.02	0.003					
	n		2	2	1		2	2	1	1	1		2					
	p (%)		0.025	0.0015	0.01		0.125	0.125	0.001	0.1	0.001		0.0015					
	N_L (dB)		0	0	0		0	0	0	0		1	1					
	M_s (dB)		18.8	5	5		11.4	14	1	1		6.8	6					
	W (dB)		0	0	0		0	0	0	0		0	0					
Terrestrial station parameters	E (dBW) in B [2]	A		–	–		–	–	–	–		–	–	–	–			
		N	40	40	40	40	42	42	–28	–28		35	35	35	44	40	40	
	P_t (dBW) in B	A		–	–		–	–	–	–		–	–	–	–			
		N	–7	–7	–7	–7	–3	–3	–81	–73		–10	–10	–10	–1	–7	–7	
	G_x (dBi)		47	47	47	47	45	45	53	45		45	45	45	45	47	47	
Reference band-width [6]	B (Hz)		10^7	10^6	10^6		10^7	10^7	1	1		10^6	10^6	10^6	10^6			
Permissible interference power	$P_r(p)$ (dBW) in B		–115	–140	–137		–120	–116	–216	–217		–140						

[1] A: analogue modulation; N: digital modulation.

[2] E is defined as the equivalent isotropically radiated power of the interfering terrestrial station in the reference bandwidth.

[3] Non-geostationary mobile-satellite service feeder links.

[4] Non-geostationary-satellite systems.

[5] Geostationary-satellite systems.

[6] Non-geostationary fixed-satellite service systems.

[7] Two frequency bands are currently under consideration, either from 18.0-18.3 GHz or from 18.1-18.4 GHz.

2/1.2/5.2 Issue B

For Method B1, the new appropriate emission limits with a grandfathering of existing systems would be provided, either by modifying the existing RR No. **5.482** text or, alternatively, by adding a new footnote and a Resolution applicable to both the FS and MS or in separate footnotes addressing each service. Such regulatory text would contain a restriction on the elevation angle for the fixed service in addition to limits on the maximum transmitter power for point-to-point (including ATPC) and point-to-multipoint stations (with differentiation between hub and customer terminals) in the fixed service. Additionally an EIRP limit for point-to-multipoint hub stations would be included. For stations in the mobile (except aeronautical mobile) service a maximum transmitter power would apply. The values covered in such regulatory text would be based on those given in Table 1.2-1. In including those limits into the RR, a definition of ATPC, point-to-point and point-to-multipoint in the RR may be required.

For Method B2, the regulatory text would contain a restriction on the elevation angle for the fixed service in addition to the current limits on the maximum transmitter power as given in RR No. **5.482,** and would, for the mobile service (except aeronautical mobile), contain limits on the maximum equivalent isotropic radiated power and the maximum transmitter power.

For Method B3, a new footnote would be added that would request administrations to apply, to the maximum extent practical, the mitigation techniques described in [Recommendation[s] TBD-10 GHz] when placing new Earth exploration-satellite service (passive), space research service (passive) and fixed service stations into operation in the 10.6-10.68 GHz band.

The above-mentioned [Recommendation[s] TBD-10 GHz] may be either Recommendations ITU-R F.[9D/219 Annex 6] and ITU-R RS.[10/36 GHz MITIGATE], or a new WRC Recommendation to be included in the Final Acts of WRC-07. It is not intended that the ITU-R Recommendations be incorporated by reference into the RR.

If one of these methods is accepted, the relevant texts from Resolution **746 (WRC-03)** dealing with this issue may be deleted.

2/1.2/5.3 Issue C

For Method C1, the emission limits would be included in a new footnote (similar to RR No. **5.482**) corresponding to the band 36-37 GHz with a grandfathering of existing systems. Alternatively, the new limits could be specified in separate footnotes addressing the FS and MS.

For Method C2, a footnote would be added to the 36-37 GHz band in the Table of Frequency Allocations in RR Article **5** with text similar to that indicated for Method B3. It is not intended that the Recommendations be incorporated by reference into the RR.

If one of these methods is accepted, Resolution **742 (WRC-03)** dealing with this issue may be deleted.

Agenda item 1.20

"to consider the results of studies, and proposals for regulatory measures if appropriate regarding the protection of the EESS (passive) from unwanted emissions of active services in accordance with Resolution 738 (WRC-03)"

Executive summary

WRC-07 Agenda item 1.20 addresses the compatibility between the Earth exploration-satellite service (EESS) (passive) and active services in adjacent or nearby bands as specified in Resolution **738 (WRC-03)**. The results of the studies carried out for each band pair under this agenda item are documented in Report ITU-R SM.2092, which replaces Recommendation ITU-R SM.1633 for the purpose of this Resolution.

Based on the results of these studies, regulatory measures to ensure protection of the EESS (passive) from unwanted emissions of active services may be considered, while taking into account the impact on all concerned services of implementing or not implementing such measures.

For each band pair studied, the appropriate method to satisfy the agenda item may be decided independently. In addition to the methods described below, the Conference may decide that, for a given band pair, no regulatory measures are required.

One method is to establish, in an EESS (passive) band, a mandatory power limit for unwanted emissions from a single transmitter of a specified service in an adjacent or nearby band without examination by the Bureau. Another method is to establish, in an EESS (passive) band, a non-mandatory power limit for unwanted emissions from a single transmitter of a specified service in an adjacent or nearby band. The third method is to strongly encourage administrations to take all practicable steps to limit unwanted emissions in EESS (passive) bands from active services in adjacent and nearby frequency bands.

Resolution 738 (WRC-03) – Compatibility analyses between the Earth exploration-satellite service (passive) and active services

2/1.20/1 **Issue A –** Resolution **738 (WRC-03)** *resolves*

"1 to invite ITU-R to continue or to initiate studies on the compatibility analyses between EESS (passive) and the corresponding active services as listed in the Table with a view to updating Recommendation ITU-R SM.1633 or developing additional Recommendations"

2/1.20/1.1 Background

Allocations for EESS (passive) were established by WARC-79 at specific frequencies where passive sensing of important parameters is uniquely possible. These allocations necessarily were adjacent to allocations for active services, many of which have been implemented for active transmission systems that, like EESS (passive) measurements, are also vital to national economies, and safety-of-life applications in some cases.

Active systems in adjacent or nearby bands emit weak unwanted emissions that fall within the EESS (passive) allocations (RR Nos. **1.144-1.146** and RR Appendix **3**), thus presenting a risk that unwanted emissions could cause unacceptable interference to EESS (passive) measurements.

Prior WRC-03, ITU-R conducted studies between the EESS (passive) and active services in certain adjacent or nearby bands that are depicted in Recommendation ITU-R SM.1633. WRC-03 did not reach any agreement and decided to further the studies according to Resolution **738 (WRC-03)** for specified pairs of frequency allocations EESS (passive) and active services.

EESS passive sensors measure very low power level natural radiations, in certain frequency bands mainly determined by fixed physical properties (e.g. molecular resonance), from specific components of land, bodies of water, and the atmosphere. Bands below 100 GHz are of particular importance, as they provide an "all-weather" capability since clouds are nearly transparent at these frequencies.

Low levels of interference received at the input of the passive sensors may degrade passive sensor operations. A unique technical complication of these frequency compatibility situations is the fact that EESS (passive) sensors are unable to discriminate between natural radiations and low or moderate levels of interference. Measurements corrupted by such interference would be mistaken to be accurate data because there is no practical independent means for reliably checking the integrity of the measurements and subsequent use of this corrupted data may unpredictably impact the results of applications using that data. On the other hand, technologies now under development for sensor operations in one band will be able to detect persistent and extremely high levels of interference so they would be seen to be anomalous and discarded before the corrupted data are mistakenly used.

Measurements over a single country are not only used for weather forecasts in that country where the measurement was obtained but also for global modelling of the atmosphere used by and exchanged among all National Weather Services (NWS) in respect of their international commitments related to the World Weather Watch of the World Meteorological Organisation (WMO) to develop weather forecasts for other countries. Passive sensor products are used in support of farming, transportation, flood warnings and control, and other endeavours that are important to national interests and economies. The progress made in the recent years in weather and climate analysis and forecasts, including warnings for dangerous weather phenomena (heavy rain, storms, cyclones) that affect all populations and economies, is to a great extent attributable to spaceborne observations and their assimilation into numerical models. The importance of passive sensing on meteorological and related environmental activities has already been stressed by the WMO.

Several geophysical parameters contribute, at varying levels, to natural emissions, which can be observed at a given frequency that present unique properties. Therefore, measurements at several frequencies must be made simultaneously in order to isolate and to retrieve each individual contribution. This interdependency of measurements at several frequencies is the case for the specific bands considered under WRC-07 Agenda item 1.20, with the exception of the 1 400-1 427 MHz band for which the interdependence with other measurements at other frequencies does not exist for the parameters under scrutiny. Interference that could impact a given "passive" frequency band could thus have a negative impact on the overall measurement of several atmospheric components.

However, the potential interdependency of interference in various passive bands is a complex issue that has not been studied thoroughly in the ITU-R, including the extent to which interference in one band has any impact on measurements in another band. In particular, these interdependencies have not been taken into account in the development of the permissible interference levels for EESS (passive) specified in Recommendation ITU-R RS.1029-2 and were not taken into account in studies under WRC-07 Agenda item 1.20.

2/1.20/1.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

For the pairs of frequency bands listed in the Table in Resolution **738 (WRC-03)**, analysis of compatibility between EESS (passive) and active services were performed using methodologies and assumptions that were improved substantially relative to those presented in Recommendation ITU-R SM.1633. The methodology and assumptions were modified to avoid overstating potential interfering signal levels. Emission levels exceeding permissible levels of interference (as defined in RR No. **1.167**) were considered in these studies. Table 1.20-1 provides an overview of the performed compatibility analyses covered under *resolves* 1 of Resolution **738 (WRC-03)**.

TABLE 1.20-1

List of compatibility studies to be addressed

EESS (passive) band	Active service band	Active service	Section	Relevant sections of Report ITU-R SM.2092
1 400–1 427 MHz	1 350–1 400 MHz	Fixed	1.3.1.1	§ 4
		Mobile	1.3.1.2	§ 6
		Radiolocation	1.3.1.3	§ 3
	1 427–1 429 MHz	Space operation	1.3.1.4	§ 5
	1 427–1 452 MHz	Fixed	1.3.1.1	§ 4
		Mobile	1.3.1.2	§ 6
23.6–24 GHz	22.55–23.55 GHz	Inter-satellite	1.3.2	§ 7
31.3–31.5 GHz	30–31 GHz	Fixed-satellite (E-to-s)	1.3.3	§ 8
50.2–50.4 GHz	47.2–50.2 GHz	Fixed-satellite (E-to-s)	1.3.4.1	§ 10
	50.4–51.4 GHz	Fixed-satellite (E-to-s)	1.3.4.2	§ 11

For each passive-active band pair, models were developed for various existing and predicted physical deployments of passive and active systems and their equipment characteristics. In order to determine the statistics of received interfering signal power levels, dynamic analyses were also conducted using time-series simulations of the orbiting EESS (passive) satellite receiver. These interfering signal levels of a single service were compared with the permissible aggregate levels of interfering signal from all sources specified in Recommendation ITU-R RS.1029-2 in order to determine an unwanted emission level for the particular combination of passive sensor and active service deployment model.

In some cases, unwanted emission characteristics of the active services were estimated from regulatory emission "masks" (or envelopes) and design objectives that generally specify maximum unwanted power densities for reference bandwidths that are much smaller than those for passive sensors (e.g. RR Appendix **3**, Recommendation ITU-R SM.1541-2). The regulatory emission masks are known to overestimate unwanted emission levels produced by actual equipment. Other analyses used Fourier transform techniques or available measurements to represent the spectrum of the radiated emission.

In cases where it was determined that the permissible level of interference may be substantially exceeded, various mitigations were considered as possible means for limiting the amount of interference in relation to the permissible levels. In an effort to ensure equitable burden sharing between the active and passive services studied, the analyses underestimated the full amount of interference and applied the full aggregate permissible levels of interference to the unwanted emissions from one service operating in an adjacent or nearby frequency allocation rather than considering the unwanted emissions from multiple active services. The resulting unwanted emission levels identified for each band pair would acceptably limit the degree to which interference will exceed aggregate permissible levels (i.e. impact on the passive service) while not unduly constraining systems in the active service. To further minimize potential impact on active services, consistent with equitable burden sharing between active and passive services, the protective levels of unwanted emissions were specified using a bandwidth on the order of the width of the passive service allocation large reference bandwidths, such that compliance with the unwanted emission levels would be facilitated by averaging the emission power densities over this bandwidth.

The following sections provide summaries of studies for the band pairs considered under *resolves* 1.

2/1.20/1.3 Analysis of the results of studies

2/1.20/1.3.1 EESS (passive) service in the 1 400-1 427 MHz band

This band mainly allows for vegetation biomass, ocean salinity, and soil moisture measurements that are essential for meteorological as well as hydrological processes. These parameters are only detectable from space between 1 and 2 GHz.

2/1.20/1.3.1.1 Fixed service in the 1 350-1 400 MHz and 1 427-1 452 MHz bands

Considering a deployment of two to three thousand FS links within the deployment areas studied, it has been shown that the EESS (passive) aggregate permissible interference criteria is satisfied if the unwanted emission power at the antenna port falling within the passive band does not exceed –71 to –53 dBW/27 MHz depending on the passive sensor and assumed FS station characteristics and deployment model in a particular study. It is also shown that existing FS links of European countries which comply with European standards on out of band (OoB) emissions are compatible with the value of −53 dBW/27 MHz for an estimated 50% of cases and –40 dBW/27 MHz in about 95% of the cases. Limiting the unwanted emission power at an antenna port of an FS P-P transmitter in these bands to a level between –53 and –40 dBW/27 MHz falling within the EESS (passive) band may not place an undue burden on the FS. While the permissible interference levels of Recommendation ITU-R RS.1029-2 will be exceeded if the unwanted emission levels produced by all FS stations fall in the upper portion of this range, limiting FS unwanted emissions to that range should still allow passive sensors to perform their missions in the 1 400-1 427 MHz band. The lower portion of this range provides greater protection of the EESS (passive) but imposes a higher level of constraints on the FS, while the upper portion of this range would result in less constraint on the FS but results in higher interference levels into the EESS (passive).

An acceptable interference may be achieved if the unwanted power measured at the antenna port within the passive band is lower than –45 dBW/27 MHz since some impact can be perceived from a single interferer for all levels higher than –40 dBW/27 MHz and most FS links are compliant with such a level.

However, it should be noted that these conclusions are based on simulations involving only P-P FS systems, and may not be applicable to P-MP systems. Consequently, further studies may be required in order to determine the impact of technical constraints on P-MP FS systems.

2/1.20/1.3.1.2 Mobile service in the 1 350-1 400 MHz and 1 427-1 452 MHz bands

One study addressed the compatibility between EESS (passive) in the 1 400-1 427 MHz band and mobile services in the 1 429-1 452 MHz band using the specification and measured levels of unwanted emissions from personal digital cellular (PDC) and International Mobile Telecommunications-2000 (IMT-2000) systems in one administration. The study adopting specification values of unwanted emission level (–53 dBW/27 MHz for the PDC system and –43 dBW/27 MHz for the IMT-2000 system) shows excess level (around 12 to 20 dB) from permissible interference power levels of EESS (passive). Limiting MS terminals unwanted emission to such levels may not place undue constraints on such MS systems.

The study adopting a measured value (–60 dBW/27 MHz) for the PDC system still exceeds permissible interference power levels of EESS (passive) by around 9 to 13 dB. The study adopting a measured value (–56.5 dBW/27 MHz) for the IMT-2000 system does not exceed permissible interference power levels of EESS (passive) in some cases. However, it should be noted that all mobile stations are manufactured to satisfy the values in the specification, i.e., not to satisfy the measured values used in this study. There is no guarantee that all mobile stations can achieve these measured unwanted emission levels in every scenario.

Limiting MS terminals unwanted emission levels to the value of –73 dBW/27 MHz for the PDC system and –59 dBW/27 MHz for the IMT-2000 system in this band could satisfy permissible interference power levels of EESS (passive) in this study but will impose undue constraints on the MS.

Adoption of sufficient frequency separation between the EESS (passive) band and the MS band, and addition of MS terminal filtering may be possible mitigation techniques, however, implementation of these mitigation techniques in order to provide full protection of EESS (passive) will impose undue constraints on mobile stations of cellular systems.

Limiting MS unwanted emission levels to the value of –60 dBW/27 MHz in this band could provide adequate protection of EESS (passive) in some cases but will impose undue constraints on the MS. However, unwanted emission levels at the –43 dBW/27 MHz specification would not place any new constraints on such systems but could cause unacceptably high levels of interference to the EESS (passive).

The band 1 429-1 435 MHz is also allocated to the aeronautical mobile service in eight Region 1 administrations on a primary basis exclusively for the purposes of aeronautical telemetry within their national territory (RR No. **5.342**).

A static analysis has shown that AMT systems operating under regulatory conditions in force prior to 2003, with an unwanted emission power level of –22 dBW/27 MHz, would exceed the protection criteria by 22.6 to 32.6 dB for some types of passive sensors, and only slightly exceed protection criteria for another type of passive sensor.

Characteristics for AMT systems are given in Annex 1, § 2.1 of Recommendation ITU-R M.1459. Using emission masks derived from RR Appendix **3** and Recommendation ITU-R SM.1541, AMT systems should be able to meet a maximum unwanted power level from –28.6 dBW/27 MHz to –22.8 dBW/27 MHz depending on the channel bandwidth. However, integration of these masks over the 27 MHz reference bandwidth will most likely overestimate unwanted emission levels.

It is expected that, when using dynamic analyses, new AMT systems with an unwanted emission power level no greater than –28 dBW/27 MHz will protect EESS (passive) sensors from harmful interference.

In addition to the systems described above, some administrations operate transportable radio-relay systems in the mobile service, while others operate such systems in the fixed service. Such systems operating in the mobile service should meet the same unwanted emission levels as those resulting from the fixed service analysis (see § 2/1.20/1.3.1.1).

2/1.20/1.3.1.3 Radiolocation service in the 1 350-1 400 MHz band

This compatibility study has shown that if the outcome of the dynamic analyses as presented can be taken as representative for many existing systems, it can be concluded that a number of the existing radar systems already meet the proposed average unwanted emission power limit of –29 dBW/27 MHz. Future designs for these systems would meet the proposed unwanted emission average power. For the systems that do not meet this level, a number of mitigation techniques may be implemented.

With an average level of –29 dBW/27 MHz satellite interference largely exceeding the availability criteria will occur but some useful data could still be retrieved. Far from representing the ideal situation, a scenario with unwanted emission limits beyond –29 dBW/27 MHz represents a significant impact to the EESS (passive) operations.

It may be difficult to measure and comply at the transmitter output with the proposed –29 dBW/27 MHz average level for radar output device emissions above 1 400 MHz. Additionally, compliance with such a criteria may impose implementation burdens; however, the radar systems comply with the spurious emission limits of RR Appendix **3**.

The application of theoretical mitigation methods to help radar systems achieve compliance with the proposed –29 dBW/27 MHz average power density level may negatively impact radar system operational performance and may represent a significant additional burden on the radiolocation service, including, e.g. impact on the use of available spectrum.

Finally, the proposed average power density of –29 dBW/27 MHz represents impacts to both services.

2/1.20/1.3.1.4 Space operation service (Earth-to-space) in the 1 427-1 429 MHz band

The compatibility analysis has calculated the potential interference from space operation service (SOS) in the 1 427-1 429 MHz band into the 1 400-1 427 MHz band allocated to the EESS (passive). Based on the notified maximum earth station power and bandwidth values and the unwanted emission mask of Recommendation ITU-R SM.1541-2 in the 1 400-1 427 MHz band, the results show that unwanted emissions in the SOS would cause interference exceeding the EESS (passive) aggregate interference criteria by about 60 dB. An unwanted emission level transmitted by the SOS uplink earth station exceeding –41 to –36 dBW/27 MHz, depending on the passive sensor considered, would result in the interference exceeding the permissible level.

The SOS unwanted emissions into the passive band can be greatly reduced during normal operations via techniques such as use of the lowest practicable transmit power (RR Nos. **3.3**, **15.2** and **15.5**) and operating with the characteristics indicated in RR No. **1.153**. With the use of these techniques, the SOS unwanted emission transmit power into the passive band can be reduced during normal operations to –41 dBW/27 MHz for operations with low-Earth orbit constellations, and would not exceed the EESS (passive) permissible interference criteria. With the same combination of mitigation techniques, the SOS unwanted emission transmit power into the passive band can be reduced during normal operations to –8 dBW/27 MHz for operations with medium-Earth orbit constellations, and would exceed the EESS (passive) permissible interference criteria by 28 dB. A limit on the unwanted emissions from an SOS uplink earth station up to 10 dB above the –41 to –36 dBW/27 MHz range of permissible unwanted emission power levels indicated in the studies may still allow EESS (passive) sensors to fulfil their scientific missions in the 1 400-1 427 MHz band while not causing undue constraints on the SOS in the 1 427-1 429 MHz band.

2/1.20/1.3.2 EESS (passive) service in the 23.6-24 GHz band and inter-satellite service in the 22.55-23.55 GHz band

Regarding the EESS (passive), this band is essential for calibration of other passive band data. It corresponds to water-vapour measurements and is unique since it is the only band where this parameter can be measured through clouds providing vital information on atmosphere humidity.

Dynamic simulation analyses were conducted to estimate the expected levels of interference caused to several types of curent and planned passive sensors operating in the 23.6-24 GHz band from unwanted emissions from the inter-satellite service (ISS) links of the non-GSO mobile-satellite service (MSS) systems and GSO data-relay systems.

The simulations of the ISS links in the GSO data relay systems indicate that the permissible interference criteria of Recommendation ITU-R RS.1029-2 will be satisfied for all the passive sensors.

The simulations of the ISS links in the non-GSO MSS systems indicate that the permissible interference criteria of Recommendation ITU-R RS.1029-2 will be satisfied for current sensors such as the conical scan and the nadir scan passive sensors. For future passive sensors such as a push-broom sensor, the study shows that an unwanted emission level of –46 dBW/200 MHz of ISS links having antenna gains less than 55 dBi and transmitting data (with modulation) in the 23.6-24 GHz band would satisfy the permissible interference criteria of Recommendation ITU-R RS.1029-2. This level of attenuation can be easily met by ISS systems, including the ISS links in the non-GSO MSS systems.

2/1.20/1.3.3 EESS (passive) service in the 31.3-31.5 GHz band and fixed-satellite service (Earth-to-space) in the 30-31 GHz band

Regarding the EESS (passive), sensor measurements in this band are used to determine cloud liquid water content. This band is unique in that it is a frequency range where emissions from other sources (water vapour and oxygen) reach a minimum. Data collected in this band are essential for predicting all forms of precipitation over land and oceans.

The 30-31 GHz band is used by some administrations for high capacity links in the Earth-to-space direction in support of global communications.

Several dynamic simulations concluded that currently operational GSO and non-GSO FSS systems and future broadband GSO FSS systems operating in the 30-31 GHz band are compatible with the EESS (passive) service in the 31.3-31.5 GHz band. Simulations using actual FSS parameters showed that an uplink producing an unwanted emission power level of –9.7 dBW/200 MHz in the 31.3-31.5 GHz band would achieve compatibility. These studies concluded that the 300 MHz separation between the edges of the two bands, together with any out-of-band attenuation provided by band-limited components in the FSS earth station uplink equipment chain, such as the diplexer, are sufficient to protect the EESS (passive).

Other simulations for future passive sensors and their corresponding attenuation assessment showed that an FSS uplink producing an unwanted emission power level of –20 dBW/200 MHz in the 31.3-31.5 GHz band would achieve compatibility. This reduced power level may constrain the FSS.

2/1.20/1.3.4 EESS (passive) service in the 50.2-50.4 GHz band

Measurements made in this band are essential for measuring atmospheric temperatures near the Earth's surface and for calibration of passive frequencies from 52.6 to 59.3 GHz used for determining atmospheric temperature profiles. The band is also used to improve sea ice and sea emissivity measurements. There is a strong emission in this band from oxygen but nothing from ice cloud and little from water vapour.

2/1.20/1.3.4.1 Fixed-satellite service (Earth-to-space) in the 47.2-50.2 GHz band

Two sets of dynamic simulations were conducted to evaluate the interference levels that might be produced by unwanted emissions of FSS uplinks into a passive sensor. These dynamic simulations concluded that the EESS (passive) aggregate permissible interference criteria may be exceeded by the FSS if the unwanted emission powers exceed –34.5 to –10.7 dBW/200 MHz.

One of these studies considered a large range of FSS earth station deployment densities with parameters similar to those proposed in recent ITU-R satellite filings and represents an upper limit on FSS uplink deployment densities, with the highest densities assumed in the simulations unlikely to be achievable in practice. This study concludes that the current passive sensors will be adequately protected from interference if the unwanted emissions of an FSS uplink earth station falling into the 50.2-50.4 GHz band at the FSS antenna input do not exceed in the range of –20 to –10 dBW/200 MHz for VSAT applications and for gateway/hub applications. This study is based on the use of the FSS reference antenna pattern in Recommendation ITU-R S.465-5. If an actual FSS uplink antenna pattern for a high capacity, wide bandwidth gateway antenna, with its improved roll off characteristics were used, unwanted emissions radiated into the 50.2-50.4 GHz band would be reduced. This factor should be taken into account when establishing the unwanted emission levels. A level of –10 dBW/200 MHz could be reasonable under this scenario. It should be noted that the simulations on which these conclusions are based assume FSS uplink transmit power density levels corresponding to clear sky conditions, and that these levels can be exceeded during fading conditions by the amount of power increase needed to maintain FSS link availability during fading conditions.

The second study concludes that, taking into account the results of the different simulations and their corresponding attenuation assessment, limiting FSS uplinks in the band 47.2-50.2 GHz, to an unwanted emission level of power of –20 dBW/200 MHz within the 50.2-50.4 GHz band is necessary to achieve compatibility. It is to be noted that this proposed OoB level can be met by the FSS systems considered in this study.

Finally, these studies indicate that EESS (passive) sensors will be adequately protected from interference if the unwanted emissions of an FSS uplink earth station falling into the 50.2-50.4 GHz band at the antenna input do not exceed a value in the range of –20 to –10 dBW/200 MHz.

2/1.20/1.3.4.2 Fixed-satellite service (Earth-to-space) in the 50.4-51.4 GHz band

One set of dynamic simulations of interference into a current passive sensor concluded that EESS (passive) aggregate permissible interference criteria may be exceeded by the FSS if the unwanted emission powers exceed –34.5 to –10.7 dBW/200 MHz. This study considered a large range of FSS earth station deployment densities with parameters similar to those proposed in recent ITU-R satellite filings, with the highest densities assumed in the simulations unlikely to be achievable in practice. This study concludes that the EESS (passive) will be adequately protected from interference if the unwanted emissions of an FSS uplink earth station falling into the 50.2-50.4 GHz band at the FSS antenna input do not exceed in the range of –20 to –10 dBW/200 MHz for VSAT applications and for gateway/hub applications. This study is based on the use of the FSS reference antenna pattern in Recommendation ITU-R S.465-5. If an actual FSS uplink antenna pattern for a high capacity, wide bandwidth gateway antenna, with its improved roll off characteristics were used, unwanted emissions radiated into the 50.2-50.4 GHz band would be reduced. This factor should be taken into account when establishing the unwanted emission levels. A level of –10 dBW/200 MHz could be reasonable under this scenario. It should be noted that the simulations on which these conclusions are based assume FSS uplink transmit power density levels corresponding to clear sky conditions, and that these levels can be exceeded during fading conditions by the amount of power increase needed to maintain FSS link availability during fading conditions.

Another set of dynamic simulations using future passive sensors and some wide bandwidth FSS earth stations concluded that a limitation of the emission power supplied to the FSS antenna port of –15 dBW/200 MHz within the passive band, for a single GSO FSS system, would protect the EESS (passive) band 50.2-50.4 GHz from unwanted emissions of FSS uplinks operating within the band 50.4-51.4 GHz for typical FSS earth station antenna gains between 55 and 65 dBi. It is to be noted that this proposed unwanted emission level can be met by the FSS systems considered in this study.

Finally, these studies indicate that EESS (passive) sensors will be adequately protected from interference if the unwanted emissions of an FSS uplink earth station falling into the 50.2-50.4 GHz band at the antenna input do not exceed a value in the range of –20 to –10 dBW/200 MHz.

2/1.20/2 **Issue B –** Resolution **738 (WRC-03)** *resolves*

"2 to invite ITU-R to further study the impact of implementing the values provided in *considering f)* and *g)* for unwanted emissions of fixed-service systems operating in Regions 2 and 3, taking into account that the impact on fixed-service systems in Region 1 has already been investigated"

"*considering*

f) that according to Recommendation ITU-R SM.1633, the EESS (passive) in the band 31.3-31.5 GHz can be protected if the unwanted emissions of fixed-service systems (except high-altitude platform stations (HAPS)) operating in the band 31.0-31.3 GHz do not exceed –38 dBW in a 100 MHz reference bandwidth in the band 31.3-31.5 GHz;

g) that according to Recommendation ITU-R SM.1633, the EESS (passive) in the band 52.6-54.25 GHz can be protected if the unwanted emissions of fixed-service systems operating in the band 51.4-52.6 GHz do not exceed –33 dBW in a 100 MHz reference bandwidth in the band 52.6-54.25 GHz;"

2/1.20/2.1 Background

Further to the background in § 2/1.20/1.1, studies in Recommendation ITU-R SM.1633 already reached conclusions, prior to WRC-03, on the levels of unwanted emissions that would protect EESS (passive) services in the bands 31.3-31.5 GHz and 52.6-54.25 GHz bands from unwanted emissions of fixed services in Region 1. Resolution **738 (WRC-03)** directed the ITU-R to study the impact implementing those protection values in Regions 2 and 3.

2/1.20/2.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

For the two pairs of bands listed in *considering f)* and *g)* of Resolution **738 (WRC-03)**, compatibility analysis between EESS (passive) and active services have been documented in Recommendation ITU-R SM.1633 for Region 1. This Recommendation also indicates the impact of implementing or not implementing the identified compatibility solutions on all the involved services.

In addition to Recommendation ITU-R SM.1633, other relevant Recommendations include Recommendation ITU-R RS.1029-2. Table 1.20-2 provides an overview of the performed compatibility analyses covered under *resolves* 2 of Resolution **738 (WRC-03)**.

TABLE 1.20-2

List of compatibility studies to be addressed

EESS (passive) band	Active service band	Active service	Relevant sections of Report ITU-R SM.2092
31.3-31.5 GHz	31-31.3 GHz	Fixed (except HAPS)	§ 9
52.6-54.25 GHz	51.4-52.6 GHz	Fixed	§ 12

The studies have confirmed that the limits proposed in Resolution **738 (WRC-03)** for Region 1 on unwanted emissions falling in the bands 31.3-31.5 GHz and 52.6-54.25 GHz would adequately protect EESS (passive) if the limits were to be applied in all three Regions.

The following sections provide summaries of studies for the band pairs considered under *resolves* 2.

2/1.20/2.3 Analysis of the results of studies

2/1.20/2.3.1 EESS (passive) service in the 31.3-31.5 GHz band and fixed service in the 31-31.3 GHz band

The EESS (passive) in the band 31.3-31.5 GHz is protected if the unwanted emissions of fixed-service systems (except HAPS) operating in the band 31.0-31.3 GHz do not exceed –38 dBW in a 100 MHz reference bandwidth in the passive band 31.3-31.5 GHz.

2/1.20/2.3.2 EESS (passive) service in the 52.6-54.25 GHz band and fixed service in the 51.4-52.6 GHz band

The EESS (passive) in the band 52.6-54.25 GHz is protected if the unwanted emissions of fixed-service systems operating in the band 51.4-52.6 GHz do not exceed –33 dBW in a 100 MHz reference bandwidth in the passive band 52.6-54.25 GHz.

2/1.20/3 Methods to satisfy the agenda item

For each band pair covered by Resolution **738 (WRC-03)**, the Conference may decide to select one of the methods described below to satisfy the agenda item. In addition to the methods described below, the Conference may decide that, for a given band pair, no regulatory measures are required.

In considering the methods described below, the Conference may have to determine how each method ensures equitable burden sharing for achieving compatibility between active and passive services as considered in Resolution **738 (WRC-03).**

2/1.20/3.1 Method A

Under this method, the Conference would establish, in an EESS (passive) band, a mandatory power limit for unwanted emissions from a single transmitter of a specified service in an adjacent or nearby band.

Advantages:

– Provides regulatory certainty beneficial to the future planning of both active and passive services.

– Passive sensors will be able to operate compatibly in the presence of future systems of the active services operating in specified adjacent or nearby bands.

Disadvantages:

– Precludes administrations' flexibility in regulating unwanted emissions in the specified EESS (passive) bands.

– In case the underlying assumptions, criteria and predictions used in the analyses prove not to be suitable or appropriate in practice from the standpoint of equitable burden-sharing, mandatory limits may need to be modified, requiring future Conference action.

2/1.20/3.2 Method B

Under this method, the Conference would establish, in an EESS (passive) band, a non-mandatory power limit for unwanted emissions from a single transmitter of a specified service in an adjacent or nearby band.

Advantages:

– Provides administrations flexibility in regulating unwanted emissions in the specified EESS (passive) bands.

– Provides administrations flexibility in case the effect of unwanted emissions cannot be predicted with reasonable certainty.

Disadvantages:

– Because meteorological and climatological forecasts for any given geographic area require reliable data from other areas, non-mandatory limits will not guarantee effective worldwide protection of the EESS (passive) if all administrations would not implement the recommended levels.

– In case interference to passive sensors would be detected, this method may make it more difficult for administrations to remedy the situation.

2/1.20/3.3 Method C

Under this method, the Conference would strongly encourage administrations to take all practicable steps to limit unwanted emissions in EESS (passive) bands from active services in adjacent and nearby frequency bands.

Advantages:

– Provides an alternative to regulatory limits or recommended levels perceived as impractical to implement.

Disadvantages:

– Unspecified limits will not guarantee effective worldwide protection of EESS (passive) operations that are required for adequate meteorological and climatological forecasts.

– This method is equivalent to the situation with respect to radio astronomy as in RR No. **5.149** that has been shown as not necessarily preventing cases of harmful interference.

– This method is already covered by RR No. **3.3**.

– In case interference to passive sensors would be detected, this method may make it more difficult for administrations to remedy the situation.

2/1.20/4 Regulatory and procedural considerations

Where appropriate, changes to the Table of Frequency Allocations in RR Article **5** will be required, consistent with each method.

A single Conference Resolution, Conference Recommendation or a footnote could provide solutions for some or all band pairs covered by Resolution **738 (WRC-03)** whatever the method applied for each of those band pairs. In addition, it may be appropriate that, for a given band pair, no change to the RR would be required for that band pair.

The regulatory and procedural considerations for Issue A and Issue B are identical and therefore will be mentioned only once.

2/1.20/4.1 Method A

A footnote in RR Article **5** similar to RR No. **5.347A** would require compliance with unwanted emission limits in a Conference Resolution. The Conference Resolution would provide the limits of unwanted emissions in the EESS (passive) band.

The Resolution would also need to specify that neither examination nor finding by the Radiocommunication Bureau is required under either RR Article **9** or **11**. The values specified in this Resolution would only be applicable for active systems brought into use after a future date to be decided by WRC-07.

Alternatively, a footnote in RR Article **5** with the appropriate limit for the unwanted emission can be included on a band-by-band basis.

In the view of one administration, there is a need to consider the regulatory validity of Method A, taking into account RR No. **4.7** and other relevant provisions of the RR.

However, a group of administrations indicated that WRC-03 established similar provisions in RR Article **5** (RR No. **5.543A** dedicated to HAPS in the 31 GHz band for example) and hence, confirms that such a method has regulatory validity.

An example Resolution is provided below.

ADD

RESOLUTION [EESS (PASSIVE)] (WRC-07)

Compatibility between the Earth exploration-satellite service (passive) and active services

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that primary allocations have been made to various space services in the Earth-to-space direction such as the fixed-satellite service, space operation service, inter-satellite service and/or to terrestrial services such as the fixed service, mobile service and radiolocation service, hereafter referred to as “active services”, in bands adjacent or nearby to bands allocated to the Earth exploration-satellite service (EESS) (passive);

b) that unwanted emissions from active services may cause unacceptable interference to the EESS (passive);

c) that for technical or operational reasons, the general limits in Appendix **3** may be insufficient in protecting the EESS (passive) in specific bands;

d) that, in many cases, the frequencies used by the EESS (passive) sensors are chosen to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems may not be possible;

e) that it is necessary to ensure an equitable burden sharing for achieving compatibility between active and passive services operating in adjacent or nearby bands,

noting

a) that frequency bands covered by No. **5.340** which prohibits all emissions need to be fully protected as they are unique natural resources;

b) that Report ITU-R SM.2092 provides a methodology for conducting the compatibility studies between active and passive services operating in adjacent and nearby bands and develops all relevant scenarios;

c) that Recommendation ITU-R RS.1029-2 provides the permissible interference criteria for satellite passive remote sensing, *resolves*

1 that unwanted emissions from stations, brought into use after 1 January 20XY, in the bands and services listed in Table 1, shall not exceed the corresponding limits in that Table,

2 that the Bureau shall make no examination or finding with respect to this Resolution under either Article **9** or **11**.

TABLE 1

Passive band	Active band	Active service	Measure to protect passive band
X	Y	Z	Limit unwanted emissions ***** of [service Y systems] into the passive band to [XX dBW/refBW]
…	…	…	…

***** The unwanted emission power level is defined as the level at the transmitter antenna port (i.e. not including the antenna gain).

2/1.20/4.2 Method B

A footnote in RR Article **5** would recommend the use of maximum levels of unwanted emissions provided in a Conference Resolution or Conference Recommendation. This Resolution or Recommendation would provide recommended maximum levels of unwanted emissions in the EESS (passive) band. The values specified in this Resolution would only be applicable for active systems brought into use after a future date to be decided by WRC-07.

The example Resolution under Method A could be used where the *resolves* 1 would be changed or a *resolves* would be added:

"that administrations are urged to take all reasonable steps to ensure that stations, brought into use after 1st January 20XY, in the bands and services listed in Table X, comply with the limits contained in Table X."

2/1.20/4.3 Method C

A Conference Resolution, Conference Recommendation or a footnote (patterned on RR No. **5.149**) would provide guidance to administrations.

The relation and potential inconsistencies with RR No. **5.340** will need to be studied. There would be a need to consider regulatory redundancy of Method C, taking into account RR No. **3.3**.

The example resolution under Method A could be used where a *resolves* would be added: "that administrations are urged to take all practicable steps to limit unwanted emissions into the EESS (passive) bands from stations in the services and bands listed in Table Y."

Table Y would not contain any limits. Also, an additional *noting* referring to RR No. **3.3** should be included in this Resolution.

Agenda item 1.21

"to consider the results of studies regarding the compatibility between the radio astronomy service and the active space services in accordance with Resolution 740 (WRC-03), in order to review and update, if appropriate, the tables of threshold levels used for consultation that appear in the Annex to Resolution 739 (WRC-03)"

Executive summary

WRC-07 Agenda item 1.21 addresses the compatibility between the radio astronomy service and active space services in adjacent or nearby bands as specified in Resolution **740 (WRC-03)**. The results of the studies carried out for each band pair under this agenda item are documented in Report ITU-R SM.2091 which replaces Recommendation ITU-R SM.1633 for the purpose of both Resolutions **739 (WRC-03)** and **740 (WRC-03)**.

Resolution **739 (WRC-03)** contains threshold levels based on the results of the studies prior to WRC-03 and provides a consultation process that addresses the case when the threshold levels in specific bands are exceeded by the active space services.

Additional studies have been carried out under this agenda item for band pairs listed in Resolution **740 (WRC-03)** and provide additional threshold levels.

One method to satisfy the agenda item is to add the threshold levels to Resolution **739 (WRC-03)** for those bands for which studies have been concluded. Another method is to add the threshold levels to that Resolution but to specifically exclude the radionavigation-satellite service systems for the band pair 1 559-1 610 MHz/1 610.6-1 613.8 MHz from that Resolution. A third method is to add appropriate threshold levels to Table 1-1 of Resolution **739 (WRC-03)**.

Resolution 740 (WRC-03) – Future compatibility analyses between the radio astronomy service and active space services in certain adjacent and nearby frequency bands

Resolution 739 (WRC-03) – Compatibility between the radio astronomy service and the active space services in certain adjacent and nearby frequency bands

Annex 1 to Resolution 739 (WRC-03)

Tables of pfd and epfd thresholds for unwanted emissions from geostationary and non-GSO space stations at a radio astronomy station.

2/1.21/1 Issue A – Resolution **740 (WRC-03)** *resolves*

"1 to invite ITU-R to study the compatibility between the RAS and the corresponding active space services as listed in the Table only, with a view to updating or developing ITU-R Recommendations, if appropriate"

2/1.21/1.1 Background

In preparation for WRC-03, the ITU-R conducted studies that led to the adoption of Recommendation ITU-R SM.1633, which contains nine Annexes that, using the methodology contained in the Recommendation, assess the compatibility of various band pairs between the radio astronomy service (RAS) and the active space services. Not all studies in the Annexes are complete. On the basis of Recommendation ITU-R SM.1633 and associated studies, WRC-03 adopted Resolutions **739 (WRC-03)** and **740 (WRC-03)**.

Resolution **739 (WRC-03)** contains guidance to administrations operating space and RAS stations in the band pairs contained in its Tables 1-1 and 1-2, in order to come to acceptable solutions regarding space station unwanted emissions at a RAS station. The Resolution includes a consultation process adopted at WRC-03 to assist administrations in reaching mutually acceptable solutions when unwanted emissions from active space services exceed specified threshold levels in certain RAS bands. The consultation process is included in Resolution **739 (WRC-03)** and will not be considered at WRC-07.

Resolution **740 (WRC-03)** calls for the completion of studies of the band-pairs identified in its table. Comprehensive studies were carried out to determine whether any of the band pairs from the table of Resolution **740 (WRC-03)** should be added to the tables in Resolution **739 (WRC-03)**, and, if so, to determine the impact on all the concerned active and passive services and the appropriate threshold levels for consultation.

The scope of WRC-07 Agenda item 1.21 is limited to consideration of the band pairs in the table of Resolution **740 (WRC-03)** (and the associated threshold levels for consultation) only, for the purpose of making appropriate additions from this table to the existing tables in Resolution **739 (WRC-03)**.

2/1.21/1.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

For some of the pairs of frequency bands listed in the table in Resolution **740 (WRC-03)**, compatibility analyses between the RAS and active space services were completed within ITU-R, and have been documented in Report ITU-R SM.2091. This Report also indicates the impact of implementing or not implementing the identified measures on the services involved.

In addition to Report ITU-R SM.2091, other relevant Recommendations include ITU-R RA.517-4, ITU-R RA.769-2[2], ITU-R RA.1513-1, ITU-R RA.1631, ITU-R M.1184-2 and ITU-R M.1583. A reference is also made to Report ITU-R BO.2071.

The following sections provide summaries of studies for the band pairs considered in the table of Resolution **740 (WRC-03)**.

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[2] Some technical values contained in Recommendation ITU-R RA.769-2 are not accepted by the following Administrations: Algeria, Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Mauritania, Oman, Qatar, Syrian Arab Republic and Tunisia.

2/1.21/1.3 Analysis of the results of studies

Compatibility studies have been carried out for the following band pairs:

Space service band	Space service	Radio astronomy service band
(MHz)		**(MHz)**
137-138	MSS (space-to-Earth)	150.05-153.0
387-390	MSS (space-to-Earth)	322-328.6
400.15-401	MSS (space-to-Earth)	406.1-410
620-790*	BSS (space-to-Earth)	608-614
1 525-1 559	MSS (space-to-Earth) (non-GSO systems only)	1 400-1 427
1 525-1 559	MSS (space-to-Earth) (non-GSO systems only)	1 610.6-1 613.8
1 559-1 610	RNSS (space-to-Earth)	1 610.6-1 613.8
(GHz)		**(GHz)**
21.4-22.0	BSS (space-to-Earth)	22.21-22.5

* Any change made under Agenda item 1.11 to the BSS allocation in the band 620-790 MHz may have some consequence on the inclusion of the band pair 620-790/608-614 MHz in Tables 1-1 and 1-2 of Resolution **739 (WRC-03)**.

Studies have not been completed for the following band pairs:

– 1 452-1 492 MHz/1 400-1 427 MHz BSS (non-GSO systems only)/RAS

– 2 655-2 670 MHz/2 690-2 700 MHz FSS (space-to-Earth)/RAS

– 2 655-2 670 MHz/2 690-2 700 MHz BSS (non-GSO systems only)/RAS

– 2 670-2 690 MHz/2 690-2 700 MHz FSS (space-to-Earth)/RAS

– 10.7-10.95 GHz/10.6-10.7 GHz FSS (space-to-Earth)/RAS.

2/1.21/1.3.1 Studies of the MSS (space-to-Earth)/RAS band pair 137-138 MHz/150.05-153 MHz

For non-GSO MSS constellations an epfd threshold of −238 dBW/m^2 is derived for the band 150.05-153 MHz from the RAS protection criterion given in Recommendation ITU-R RA.769-2 and the maximum radio astronomy antenna gain of 44 dBi given in Recommendation ITU-R RA.1631 for this band.

Studies have been performed taking into account the MSS characteristics given in Recommendation ITU-R M.1184-2 and the methodology in Recommendation ITU-R M.1583. Depending on the MSS constellation, the epfd threshold corresponds to a pfd per satellite varying from −216 to −193 dBW/m^2 in the whole 150.05-153 MHz band.

The unwanted emissions generated in the band 150.05-153 MHz by MSS satellites using the band 137-138 MHz fall into the spurious domain. The integration of the limit contained in RR Appendix **3** over the entire RAS band shows a discrepancy of 53 to 77 dB with regard to the above range of pfds. This discrepancy is not likely to be representative of the actual behaviour of the spurious emissions of MSS satellites, for which no information was received. The studies performed for similar MSS systems around 390 MHz suggest that it is feasible to meet such pfds without undue constraint (see below).

2/1.21/1.3.2 Studies of the MSS (space-to-Earth)/RAS band pair 387-390 MHz/ 322-328.6 MHz

For the non-GSO case, an epfd threshold of −240 dBW/m^2 (for continuum observations) and −255 dBW/m^2 (for spectral line observations) are derived for the band 322-328.6 MHz from the RAS protection criteria given in Recommendation ITU-R RA.769-2, and the maximum radio astronomy antenna gain of 51 dBi given in Recommendation ITU-R RA.1631 for this band.

Studies have been performed taking into account the characteristics of one non-GSO MSS system and the methodology in Recommendation ITU-R M.1583. For this MSS constellation, those epfd thresholds correspond to a pfd per satellite of −198 dBW/m^2 in the entire 322-328.6 MHz band (for continuum observations) and −213 dBW/m^2 in any 10 kHz portion of this band (for spectral line observations). Further calculations show that the pfd per satellite for this MSS system in the RAS band is below the pfd per satellite required to protect RAS as determined using Recommendation ITU-R M.1583 by more than 18 dB for continuum observations and more than 31 dB for spectral line observations.

For the GSO-case the levels of interference detrimental to the RAS are –189 dBW/m^2 in the band 322-328.6 MHz for continuum observation and –204 dBW/m^2 in any 10 kHz portion of this band for spectral line observation. Four GSO satellites are currently registered in the 387-390 MHz band, but their technical characteristics are not available.

2/1.21/1.3.3 Studies of the MSS (space-to-Earth)/RAS band pair 400.15-401 MHz/406.1-410 MHz

For non-GSO MSS constellations, an epfd threshold of −242 dBW/m^2 may be derived for the band 406.1-410 MHz from the RAS protection criterion given in Recommendation ITU-R RA.769-2 and the maximum antenna gain of 53 dBi given in Recommendation ITU-R RA.1631 for this band.

Studies have been performed taking into account the MSS characteristics given in Recommendation ITU-R M.1184 and the methodology in Recommendation ITU-R M.1583. The epfd threshold of −242 dBW/m^2 derived for this band corresponds to a pfd per satellite varying from −197 to −185 dBW/m^2 in the whole band 406.1-410 MHz, depending on the MSS constellation.

The unwanted emissions generated in the band 406.1-410 MHz by non-GSO MSS satellites using the band 400.15-401 MHz fall into the spurious domain. The integration of the limit contained in RR Appendix **3** exceeds the pfd per satellite by 54 to 59 dB depending on the MSS constellation. This excess above the pfd per satellite may not be representative of the actual behaviour of the spurious emissions of MSS satellites, for which no information was received. Further studies are desirable to determine the possibility of implementation of the threshold for MSS systems in this band.

2/1.21/1.3.4 Studies of the BSS/RAS band pair 620-790 MHz/608-614 MHz

For the non-GSO BSS constellation case, an epfd threshold of −241 dBW/m^2 may be derived for the band 608-614 MHz from the RAS protection criterion given in Recommendation ITU-R RA.769-2 and the maximum radio astronomy antenna gain of 56 dBi given in Recommendation ITU-R RA.1631 for this band.

A study has been performed taking into account the characteristics of a highly elliptical orbit system that may use the BSS allocation in the band 620-790 MHz, and the methodology in Recommendation ITU-R M.1583. The epfd threshold of −241 dBW/m^2 derived for this band corresponds to a pfd per satellite of −188 dBW/m^2 in the whole band 608-614 MHz. There are at present no BSS networks operating in the 620-790 MHz band, and it is not known if the unwanted emissions of the planned system will meet the above levels. It is necessary to continue studies to determine the possibility of implementation of the threshold for BSS systems. However, the need to continue such studies depends on the decision of WRC-07 on Agenda item 1.11.

For the GSO-case the level of interference detrimental to the RAS is –185 dBW/m^2 in the band 608-614 MHz for continuum observations. No spectral line observations are carried out in this band. The attenuation that future GSO satellites need to implement in order to meet the detrimental interference level in the 608-614 MHz band can be calculated by subtracting the maximum allowable e.i.r.p. within the radio astronomy band (−24 dBW) from the in-band e.i.r.p. of the GSO satellite. Emissions that fall in the radio astronomy band belong to the spurious domain. Measurements of the BSS satellite’s unwanted emissions are not available, but emissions falling in the spurious domain should be attenuated by 60 dBc (Table II of RR Appendix **3**). The spurious emission level allowed by RR Appendix **3** exceeds the detrimental interference level in the radio astronomy band by 10 dB. Experience shows that real systems are well below the requirements of RR Appendix **3** by about 20 dB, and it is therefore expected that BSS GSO satellites that operate in the 620-790 MHz band meet the RAS detrimental threshold level in the 608-614 MHz band.

2/1.21/1.3.5 Studies of the BSS (non-GSO systems only)/RAS band pair 1 452-1 492 MHz/ 1 400-1 427 MHz

No study has been provided to the ITU-R for this particular band pair.

2/1.21/1.3.6 Studies of the MSS (space-to-Earth) (non-GSO systems only)/RAS band pair 1 525-1 559 MHz/ 1 400-1 427 MHz

For the case of non-GSO MSS constellations, an epfd threshold of −243 dBW/m^2 in the full 1 400-1 427 MHz band, and an epfd threshold of −259 dBW/m^2 in any 20 kHz portion of the band is derived from the RAS protection criteria given in Recommendation ITU-R RA.769-2 and the maximum RA antenna gain of 63 dBi given in Recommendation ITU-R RA.1631 for this band.

Studies indicate that should a non-GSO MSS systems plan to operate in the band, the two epfd thresholds of −243 dBW/m^2 in the full 1 400-1 427 MHz band, and −253 dBW/m^2 in any 20 kHz portion of the band translate into a pfd per satellite of less than −190 dBW/m^2 in the entire 1 400-1 427 MHz band and a pfd per satellite of less than −206 dBW/m^2 in any 20 kHz portion of the band respectively. At present only one non-GSO MSS system used for search and rescue operations is operational in the band, which is used by a number of GSO MSS satellites.

Calculations, based on RR Appendix **3** spurious domain emission limits show the pfd per satellite −206 dBW/m^2 in any 20 kHz portion of the band derived from the epfd threshold to be exceeded by a large margin, but the integration of this limit over the RAS band is probably not realistic. For instance, studies concluded that future systems whose characteristics are similar to the search and rescue system operating in the 1 544-1 545 MHz band will meet the radio astronomy threshold criterion without additional constraints.

2/1.21/1.3.7 Studies of the MSS (space-to-Earth) (non-GSO systems only)/RAS band pair 1 525-1 559 MHz/1 610.6-1 613.8 MHz

For the non-GSO MSS constellation case, an epfd threshold of −258 dBW/m^2 in any 20 kHz portion of the 1 610.6-1 613.8 MHz band is derived from the RAS protection criteria given in Recommendation ITU-R RA.769-2 and the maximum RA antenna gain of 64 dBi given in Recommendation ITU-R RA.1631 for this band.

Studies indicate that should a non-GSO MSS system plan to operate in the band, the epfd threshold of −258 dBW/m^2 in any 20 kHz portion of the 1 610.6-1 613.8 MHz band translates into a pfd level of −205 dBW/m^2 per satellite, in any 20 kHz portion of the 1 610.6-1 613.8 MHz band. At present only one non-GSO MSS system used for search and rescue operations is operational in this band.

Calculations, based on RR Appendix **3** spurious domain emission limits show the pfd per satellite −205 dBW/m^2 in any 20 kHz portion of the band derived from the epfd threshold to be exceeded by a large margin, but the integration of this limit over the RAS band is probably not realistic. For instance, studies concluded that future systems whose characteristics are similar to the search and rescue system operating in the 1 544-1 545 MHz band will meet the radio astronomy threshold criterion without additional constraints.

2/1.21/1.3.8 Studies of the RNSS (space-to-Earth)/RAS band pair 1 559-1 610 MHz/ 1 610.6-1 613.8 MHz

For the case of non-GSO RNSS constellations, an epfd threshold of -258 dBW/m^2 in any 20 kHz portion of the band is derived from the RAS protection criterion given in Recommendation ITU-R RA.769-2 for this band. Studies have assumed that future RNSS constellations will have similar characteristics to the operational or planned ones. Two of the RNSS systems considered have more than 19.6 MHz frequency separation from the edge of the radio astronomy band. For these two systems, the epfd threshold of -258 dBW/m^2 in any 20 kHz portion of the band translates into a pfd per satellite of -212 dBW/m^2 in any 20 kHz portion of the band per satellite in the band 1 610.6-1 613.8 MHz. One of the systems already complies with this level. The other planned system is expected to comply with the same level.

The third system has only 0.6 MHz of separation from the edge of the radio astronomy band, and exceeds the epfd threshold by more than 20 dB. The measurements show that the current pfd level of unwanted emissions from a single space station of this system is -187 dBW/m^2 in any 20 kHz, when using a post emission filter. However, in the future, unwanted emissions from each satellite would possibly be able to meet the detrimental threshold pfd level of -194 dBW/m^2 in any 20 kHz portion of the band 1 610.6-1 613.8 MHz. Further reduction of unwanted emissions to the degree of filtering necessary for RNSS systems that have comparably small frequency separation from the radio astronomy band would cause distortion and degradation of the RNSS signals. Such distorted and degraded RNSS signals may no longer be useful for navigation and positioning purposes.

The feasibility of the RAS protection to the epfd limit derived from the threshold levels given in Recommendation ITU-R RA.769-2 therefore depends primarily on the frequency separation between the RNSS system centre frequency and the edge of the RAS band.

For the highly elliptical orbit RNSS system considered within ITU-R, the epfd threshold derived for this band translates into a pfd of -203 dBW/m^2 in any 20 kHz portion of the band per satellite in the band 1 610.6-1 613.8 MHz. This highly elliptical orbit RNSS system is expected to comply with this pfd per satellite.

One administration is of the opinion that, since RNSS is a safety service, any constraint that could cause detrimental effect to RNSS performance is not allowable. In the opinion of the International Civil Aviation Organization (ICAO), the frequency band 1 559-1 610 MHz "is the main allocation available for Global Navigation Satellite System (GNSS)" and in accordance to the official policies of ICAO there is "no change to the use of this band for future GNSS elements, including GLONASS and GPS".

Studies on the sharing and compatibility between one RNSS system and the RAS in the frequency band 1 610.6-1 613.8 MHz were considered at WARC-92. Based on these studies, consultations with the RAS were organized and an agreement was concluded between the operator of the RNSS system and representatives of the radio astronomy community. The RNSS operator has implemented considerable measures to mitigate interference to the RAS, in line with this agreement. This agreement provides some balance between the interests of both RNSS and RAS in the band pair 1 559-1 610 MHz/1 610.6-1 613.8 MHz.

Should a consultation process lead to more stringent limitations, the above-mentioned balance of interests would not be preserved.

Since one RNSS system might not be able to comply with such a limit, equal access of all RNSS systems to the band 1 559-1 610 MHz might not be provided.

For the GSO-case the level of interference detrimental to the RAS is –194 dBW/m^2 in any 20 kHz portion of the band 1 610.6-1 613.8 MHz for spectral line observations.

2/1.21/1.3.9 Studies of the BSS (non-GSO systems only)/RAS band pair 2 655-2 670 MHz/ 2 690-2 700 MHz

No study has been provided to ITU-R for this particular band pair.

2/1.21/1.3.10 Studies of the FSS (space-to-Earth)/RAS band pair 2 655-2 670 MHz/ 2 690-2 700 MHz

No study has been provided to ITU-R for this particular band pair in response to Resolution **740 (WRC-03)**. Previous study results may be found in Report ITU-R SM.2091.

2/1.21/1.3.11 Studies of the FSS (space- to-Earth)/RAS band pair 2 670-2 690 MHz/ 2 690-2 700 MHz

No study has been provided to ITU-R for this particular band pair in response to Resolution **740 (WRC-03)**. Previous study results may be found in Report ITU-R SM.2091.

2/1.21/1.3.12 Studies of the FSS (space-to-Earth)/RAS band pair 10.7-10.95 GHz/ 10.6-10.7 GHz

No study has been provided to ITU-R for this particular band pair in response to Resolution **740 (WRC-03)**. Previous study results may be found in Report ITU-R SM.2091.

2/1.21/1.3.13 Studies of the BSS/RAS band pair 21.4-22.0 GHz/22.21-22.5 GHz

Studies were carried out in ITU-R to assess the levels of unwanted emissions generated by a GSO BSS system into the RAS band. The studies incorporated improved characteristics of the output multiplexer filters, spreading of the spectrum of digital modulated signals outside their band due to transponder non-linearity and travelling-wave tube noise falling into the RAS band. The maximum pfd level in the 21 GHz BSS band to meet the RAS threshold levels given in Recommendation ITU-R RA.769-2 for the RAS band 22.21-22.5 GHz was derived to be −102 dBW/(m^2 · MHz).

Resolution **525 (Rev.WRC-03)** gives a threshold pfd value of −105 dBW/(m^2 · MHz) for BSS in the band 21.4-22.0 GHz for angles of arrival between 25° and 90° above the horizontal plane. If this in-band pfd level is met by the BSS, a margin of at least 3 dB can be attained with respect to the pfd threshold level in Recommendation ITU-R RA.769-2. The details of the studies are shown in Report ITU-R BO.2071.

It should be noted that the maximum pfd level in the BSS band that allows meeting the threshold level of detrimental interference in the RAS band depends very strongly on the BSS channel bandwidth, filter characteristics and the non-linear characteristics of the transponder.

2/1.21/2 Methods to satisfy the agenda item

Method 1

Add the threshold levels for those bands for which studies have been concluded to Tables 1-1 and 1-2 of Resolution **739 (WRC-03)** and modify *resolves* 5 so that the date of application of that Resolution for these new pairs of bands is set at the entry in force of the Final Acts of WRC-07. Remove those band pairs from the table of Resolution **740 (WRC-03)**. Maintain *resolves* 7 of Resolution **739 (WRC-03)** unchanged.

Advantages:

– This would ensure that the notifying administration for a satellite system planning to use the band identified in § 2/1.21/1.3 and unable to meet the threshold level would initiate consultations with administrations operating radio astronomy stations in the RAS bands identified in § 2/1.21/1.3 at an early stage.

– May avoid interference to the RAS from satellite networks for which advance publication information is received by the Bureau after the entry in force of the WRC-07 Final Acts.

Disadvantages:

– The application of the consultation process identified in Resolution **739 (WRC-03)** may add some burden on administrations.

– The consultation process may lead to technical constraints difficult to implement for some satellite systems.

Method 2

Add the threshold levels for those bands for which studies have been concluded to Tables 1-1 and 1-2 of Resolution **739 (WRC-03)**, with the exception that the applicability of Tables 1-1 and 1-2 of that Resolution is not extended to cover RNSS systems for the band pair 1 559-1 610 MHz/1 610.6-1 613.8 MHz.

Modify the *resolves* so that the date of application of Resolution **739 (WRC-03)** for these new pairs of bands is set at the entry in force of the Final Acts of WRC-07. Suppress Resolution **740 (WRC-03)**. Maintain *resolves* 7 of Resolution **739 (WRC-03)** unchanged.

Advantages:

– No additional burden on administrations and no additional constraint on RNSS for the band pair 1 559-1 610 MHz/1 610.6-1 613.8 MHz.

– Contributes to equal and continued access for all RNSS systems in the band 1 559-1 610 MHz, since at least one existing RNSS system is currently not able to comply with RAS protection criteria in the band 1 610.6-1 613.8 MHz.

Disadvantages:

– The absence of consultation process between RNSS and RAS may prevent the RAS band 1 610.6-1 613.8 MHz from being protected from unwanted emission levels that could cause detrimental interference from future RNSS systems and in this case would preclude the usage of this band by RAS for the observation of the hydroxyl radical spectral line in the future.

Method 3

Incorporation of the threshold levels studied for the GSO case into Table 1-1 and no incorporation of the threshold levels for the non-GSO case studied into Table 1-2 of Resolution **739 (WRC-03)**.

Advantages:

– No additional burden on administrations or constraints on non-GSO satellite systems.

– May avoid interference to the RAS from GSO satellite networks for which advance publication information is received by the Bureau after the entry in force of the WRC-07 Final Acts.

Disadvantages:

– The absence of a consultation process between non-GSO satellite system downlinks and the RAS may prevent RAS stations from being protected from unwanted emission levels from satellites operating in the space service bands included in Resolution **740 (WRC-03)**.

– May require the continuation of studies under Resolution **740 (WRC-03)** for future WRC cycles.

2/1.21/3 Regulatory and procedural considerations

Where appropriate, changes to the Table of Frequency Allocations in RR Article **5** will be required, consistent with each method.

Should the Conference adopt these threshold levels, there may be a need to also adopt provisions to avoid their retroactive application.

Considerations related to implementation of each of the above methods.

Method 1

The Tables 1-1 and 1-2 of Resolution **739 (WRC-03)** are filled with all new available levels in all bands for which studies have been concluded. *Resolves* 5 is also modified so that the date of application of that Resolution for these new pairs of bands is set at the entry in force of the Final Acts of WRC-07. The table of band pairs to be considered for future studies in Resolution **740 (WRC-03)** is updated removing all the bands for which studies have been concluded.

This method would necessitate a modification of RR No. **5.347A** to insert additional frequency bands, and this footnote should be associated with relevant allocations in the Table (RR Article **5**).

Method 2

The Tables 1-1 and 1-2 of Resolution **739 (WRC-03)** are filled with all new available levels in all bands for which studies have been concluded except for RNSS systems for the band pair 1 559-1 610 MHz/1 610.6-1 613.8 MHz. *Resolves* 5 is also modified so that the date of application of that Resolution for these new pairs of bands is set at the entry in force of the Final Acts of WRC-07. Suppress Resolution **740 (WRC-03)**.

This method would necessitate a modification of RR No. **5.347A** to insert additional frequency bands, and this footnote should be associated with relevant allocations in the Table (RR Article **5**).

Method 3

Resolution **740 (WRC-03)** may need to be modified in order to be extended for another study period.

CHAPTER 3

FIXED-SATELLITE, MOBILE SATELLITE AND BROADCASTING-SATELLITE SERVICES BELOW 3 GHz

(Agenda items 1.7, 1.9, 1.11 and 1.17)

CONTENTS

Agenda item 1.7

"to consider the results of ITU-R studies regarding sharing between the mobile-satellite service and the SRS (passive) in the band 1 668-1 668.4 MHz, and between the mobile-satellite service and the mobile service in the band 1 668.4-1 675 MHz in accordance with Resolution 744 (WRC-03)"

Executive summary

Agenda item 1.7 addresses two issues related to the mobile-satellite service (MSS) use of the band 1 668-1 675 MHz. Issue A relates to sharing between mobile earth stations (MESs) and systems in the space research service (passive) (SRS (passive)) in the band 1 668-1 668.4 MHz. Issue B relates to sharing between the mobile service (MS) and the MSS in the band 1 668.4-1 675 MHz.

With respect to Issue A, both MSS and SRS (passive) systems planned to be operated in the band 1 668-1 668.4 MHz have been identified and sharing studies have been conducted to assess the interference from the MES to the SRS (passive) satellite. Studies have shown that sharing is generally feasible between planned MSS systems and the planned SRS (passive) system. Constraints would be required on the e.i.r.p. of some MESs or on the power delivered to the MES antennas in order to provide adequate protection to the planned SRS (passive) system. There are different regulatory options, i.e. coordination thresholds or hard e.i.r.p. limits and different parameters and values can be chosen depending on the desired balance of constraints on future SRS (passive) systems and MSS systems. With respect to Issue B, some mobile systems which operate in all or part of the band 1 668.4-1 675 MHz have been identified. In addition, other types of mobile system have been examined which, while not known to be currently operating or planned, may conceivably operate in this band in the future. Studies have shown that in general sharing between the two services is difficult and could potentially prevent the use of this band for MSS. However, as there is currently little actual use of this band for mobile systems, it would be feasible and practical to place some sharing conditions on the MS that would provide some protection to planned MSS operations without significant effect on existing MS operations.

Three methods (A1, A2 and A3) for Issue A and similarly three methods (B1, B2 and B3) for Issue B have been proposed to satisfy this agenda item. All the methods presented in § 3/1.7/3 have proposed either modification to Table 5-1 of RR Appendix **5**, Addition of footnotes in RR Article **5** or modification to Resolution **744 (WRC-03)**.

For both issues, it will be necessary to modify Resolution **744 (WRC-03)**.

Resolution 744 (WRC-03) - Sharing between the mobile-satellite service (Earth-to-space) and the space research (passive) service in the band 1 668-1 668.4 MHz and between the mobile-satellite service (Earth-to-space) and the fixed and mobile services in the band 1 668.4-1 675 MHz

3/1.7/1 **Issue A –** Resolution **744 (WRC-03)** *invites ITU-R*

"1 to complete, as a matter of urgency and in time for WRC-07, studies relating to provisions to protect space research (passive) space stations from harmful interference from mobile earth stations in the band 1 668-1 668.4 MHz, taking care to avoid undue constraints on either services"

3/1.7/1.1 Background

The band 1 668-1 668.4 MHz is allocated to the space research (passive) service (SRS (passive)) and the mobile-satellite service (MSS) (Earth-to-space). The space research allocation may be used by space based radio astronomy applications, as part of space very large baseline interferometry systems (S-VLBI). A system has previously operated in this band ("HALCA"), but is no longer operational. One other S-VLBI system has been proposed for operation in this band ("Radioastron"). The band 1 668-1 668.4 MHz is a part of the band, 1 660.5-1 668.4 MHz, allocated to SRS (passive). However S-VLBI spaceborne receivers typically receive over a much larger frequency band because a wider band of observation is needed for increasing the sensitivity of systems (see Recommendation ITU-R RA.769-2) and therefore have to use other bands under RR No. **4.4** including other bands used for MSS such as 1 626.5-1 660.5 MHz.

This band 1 668-1 668.4 MHz was allocated to the MSS at WRC-03. There are no systems yet operating in the band, but about 10 administrations have made filings to the ITU-BR for MSS systems.

There is a potential for interference from the MESs to the S-VLBI satellite and this has been studied in accordance with Resolution **744** (**WRC-03**).

3/1.7/1.2 Summary of technical and operational studies, and relevant ITU-R Recommendations and Reports

Relevant ITU-R Recommendations and Reports: Recommendation ITU-R RA.769-2, draft new Report ITU-R M.[MSS-SRS-1.6GHz].

Sharing studies have been carried out to assess the potential interference from the MESs in MSS networks to a S-VLBI receiver operating on a satellite. The characteristics of the MSS networks are based on GSO MSS systems which are expected to be introduced in the band 1 668-1 675 MHz. The sharing studies are contained in draft new Report ITU-R M.[MSS-SRS-1.6GHz].

For the S-VLBI systems, the characteristics of the former HALCA system and the proposed Radioastron system have been considered. Recommendations ITU-R RA.769-2 and ITU-R RA.1513-1, while not explicitly applicable to space-based radio astronomy applications, provide criteria for terrestrial VLBI systems which can be applied to this case with appropriate modification. The interference criteria are based on an interference limit of 1% of receiver noise (I/N = –20 dB) which may be exceeded by up to 2% of the time by one single MSS network or up to 5% time for all MSS networks.

3/1.7/1.3 Analysis of the results of studies

Studies based on the characteristics of the former HALCA system have shown that interference about 15-25 dB higher than the threshold values described above can occur. On the other hand, studies based on the characteristics of the proposed Radioastron system have shown results that are more positive than those for the former HALCA system, largely due to the different orbital characteristics.

The Radioastron system would operate at relatively high altitudes and would therefore be less susceptible to interference from MESs. The studies show that sharing between the MSS and this S-VLBI system is feasible, but some MESs with relatively high e.i.r.p. or relatively high transmitter power would be constrained. However, a future S-VLBI system with more susceptible/ less compatible orbital characteristics could suffer excessive interference from MSS systems, or could severely limit or prevent the operation of MSS systems. However, no such system has been proposed to date.

To ensure that harmful interference is not caused to an S-VLBI system, it may be necessary to carry out a detailed assessment. In some cases, it may be necessary to take into account factors such as the characteristics of the S-VLBI satellite antenna, the realistic deployment of MESs and realistic traffic scenarios and MES power control. The sharing studies have been based on some worse-case parameter values and thus in reality sharing could be feasible without constraints on MSS while still providing adequate protection to the planned SRS (passive) system. In particular, the probability of all active MESs transmitting at the same time at maximum e.i.r.p. or power is very low, in fact a single MES would normally operate at low e.i.r.p. or power levels and would operate at maximum value only to compensate for any shadowing or fading that my occur during transmission. Therefore, it is necessary to consider realistic operational parameters rather than peak or maximum values. A coordination requirement (RR No. **9.11A**) currently exists between MSS and SRS (passive) systems (see RR No. **5.379B**) and a continuation of this coordination procedure would allow such detailed factors to be considered.

While sharing between the only known system planned for this band (Radioastron) and the MSS is feasible with limited constraints for the MSS, if a new S-VLBI system with orbital characteristics similar to the former HALCA system were to expect protection to the level of the agreed criterion as mentioned in § 3/1.7/1.2 above, it would become a significant constraint on MSS operations, requiring the e.i.r.p. to be reduced by 15-25 dB, and this would effectively prevent MSS operations altogether. It may therefore be considered necessary to balance the constraints on MSS with the level of interference protection offered to S-VLBI systems.

One option would be to use a coordination threshold to place an effective cap on the protection which could be expected from MSS systems. This approach would not stop new S-VLBI systems from being deployed, but would limit the level of protection provided to such systems from MSS systems sharing the band. Any new S-VLBI systems would have to be designed to take account of the expected interference levels, and possibly make use of interference mitigation techniques.

Studies have shown that a coordination threshold for an MES based on an e.i.r.p. of 2.2 dBW/4 kHz would ensure adequate protection of the only known SRS (passive) system planned for operation in this band from the two types of MES considered. Potential use of the band 1 668-1 668.4 MHz by handheld type MESs has not been studied, and further studies are required on this issue. While constraining some planned MSS operations, this value offers a realistic possibility of operating MESs with higher e.i.r.p. through coordination. At the same time, the adequate protection of a new S-VLBI system with more sensitive characteristics or lower orbit than the currently planned S-VLBI system with very high apogee may not be possible.

Studies have shown that for the only known SRS (passive) system planned for operation in the band 1 668-1 668.4 MHz, a coordination threshold for an MES based on an e.i.r.p. of 2.2 dBW/4 kHz would ensure adequate protection from two of the MES types considered. However with regard to the "handheld" type of MES, in spite of its lower value of e.i.r.p., this threshold value may not be adequate and may still require coordination if the worst case operational parameters are considered. Nevertheless considering the significant advantage of power control and the realistic operational parameters adequate protection is likely to be feasible through coordination. At the same time, the adequate protection of a new S-VLBI system with more sensitive characteristics or lower orbit than the currently planned S-VLBI system with very high apogee may not be possible.

Another option would be to set a coordination threshold for an MES based on the power delivered to the antenna of the MES. Studies have shown that a coordination threshold for an MES based on the power delivered to the antenna of 1.5 dBW would ensure adequate protection of the only known SRS (passive) system planned for operation in this band from all types of MES considered in the study. There would be a realistic likelihood of successful coordination for those MESs for which coordination is required.

A third option would be to suppress the coordination requirement and instead to place a hard limit on the e.i.r.p. power spectral density of the MES, and a hard limit on the power spectral density delivered to the MES antenna. The values proposed are −4 dBW/4 kHz for the e.i.r.p. limit, and −11.5 dBW/4 kHz for the limit on the power delivered to the antenna. These values would ensure adequate protection the Radioastron system and any future SRS (passive) system with orbital parameters similar to those of Radioastron. At the same time the proposed limit would allow only one of the three considered types of MESs to operate in the frequency band 1 668-1 668.4 MHz.

With respect to the possible application of hard limits, there may be other parameter values and also alternative parameters (for example the total power delivered to an MES antenna) that would achieve the same protection of SRS (passive) systems as those used above.

In theory, this allocation can also be used for non-GSO MSS systems but due to regulatory restrictions which apply in certain geographical areas, it is unlikely that non-GSO MSS systems will make use of the band 1 668-1 668.4 MHz. There are currently no non-GSO MSS systems filed with the Radiocommunication Bureau and only GSO MSS systems have been studied.

3/1.7/2 **Issue B** – Resolution **744 (WRC-03)** *invites ITU-R*

“2 to study, as a matter of urgency and in time for WRC-07, the use of the band 1 668.4-1 675 MHz by the mobile service, and to complete any relevant sharing studies between the mobile service and the MSS in this band, taking care to avoid undue constraints on either service”

3/1.7/2.1 Background

The band 1 668.4-1 675 MHz is allocated to the MSS in the Earth-to-space direction and the MS on a primary basis. There are two potential interference scenarios:

1) interference from transmitting stations in the MS to receiving space stations in the MSS; and

2) interference from transmitting MES to receiving mobile stations.

Regulatory provisions relating to Scenario 2 were dealt with at WRC-03 by the inclusion of a coordination mechanism and appropriate parameters in RR Appendix **7**. However, there are currently no regulatory provisions which address potential interference from systems in the MS to MSS systems in the band 1 668.4-1 675 MHz and hence the ITU sharing studies have been focused on Scenario 1.

3/1.7/2.2 Summary of technical and operational studies, and relevant ITU-R Recommendations and Reports

Relevant ITU-R Recommendations and Reports: Recommendation ITU-R M.1040, draft new Recommendation ITU-R M.[MS-MSS-1.6 GHz] (Doc. 8/165(Rev.1)).

ITU-R has assessed the current use of the band 1 668.4-1 675 MHz by the MS. In some countries, this band is used for transportable radio-relay systems which operate as part of the MS. In one country (United States of America), the band 1 670-1 675 MHz is used for digital video broadcast-handheld (DVB-H), a high density mobile system and another country (Canada) is planning to introduce a high density mobile system. No other current or planned uses of mobile systems have been identified in ITU-R studies.

Through RR No. **5.380**, the band 1 670-1 675 MHz (together with 1 800-1 805 MHz) is intended for use, on a worldwide basis, by administrations wishing to implement aeronautical public correspondence systems. There are no aeronautical public correspondence systems operating in these bands, and no planned systems have been identified. Nevertheless, ITU-R studies have considered the potential interference to the MSS, if the band 1 670-1 675 MHz were to be used by an aeronautical public correspondence system as per RR No. **5.380**.

Recommendation ITU-R M.1040 contains characteristics of an aeronautical public correspondence system known as the terrestrial flight telecommunication system (TFTS). The characteristics of this system have been used to evaluate the interference potential to receiving space stations to be used in the ground-to-aircraft direction.

Draft new Recommendation ITU-R M.[MS-MSS-1.6 GHz] (Doc. 8/165(Rev.1)) contains the results of studies between different systems in the MS and receiving GSO MSS space stations. With respect to MSS systems, characteristics are based on GSO systems with narrow spot beams, similar to those in use in the band 1 626.5-1660.5 MHz. Due to regulatory restrictions which apply in certain geographical areas, it is unlikely that non-GSO MSS systems will make use of the band 1 668.4-1 675 MHz.

3/1.7/2.3 Analysis of the results of studies

The types of MS systems that have been analysed are in three groups:

1) transportable radio-relay systems,

2) aeronautical public correspondence systems,

3) cellular or similar high density mobile systems.

With respect to transportable radio-relay systems, the studies have shown that there is a potential for unacceptable interference to be caused to receiving space stations in the MSS. To ensure MSS spacecraft are adequately protected, the e.i.r.p. from such systems would have to be limited to −27 dBW in a 4 kHz reference bandwidth in the direction of the geostationary orbit. This figure applies to the aggregate interference, and a lower value may be necessary to account for multiple interferers. This would result in pointing and/or e.i.r.p. restrictions unacceptable for transportable radio-relay systems (up to 60% of the azimuths would be excluded) and would therefore prevent the use of such applications in the band. It is therefore concluded that, in general, sharing of such systems with the MSS is not feasible. It has however to be noted that such systems could continue to operate in the band 1 668.4-1 675 MHz under the fixed service (FS) in some administrations. Considering this and the low-scale usage of this band by such MS systems (only used in a relatively small number of countries), it is therefore concluded that placing sharing conditions on such MS systems would not result in a significant impact on MS operations in this band.

With respect to aeronautical public correspondence systems, studies have shown that a ground station will cause harmful interference to any “visible” MSS space station. This means, for example, that a single ground station near the equator could cause harmful interference to an MSS GSO space station anywhere within a longitude range ±81° from the longitude of the ground station. It is therefore concluded that sharing between aeronautical public correspondence systems and the MSS is not feasible. Since no current or planned use of aeronautical public correspondence systems has been identified, the removal of the band 1 670-1 675 MHz from RR No. **5.380**, or the complete suppression of RR No. **5.380,** may be considered.

With respect to the third group of mobile systems, co-coverage sharing would not be feasible. It has been recognized that transmissions from MESs would be likely to interfere with receiving mobile stations. Also, transmissions from mobile stations would be likely to interfere with receiving MSS satellites. Furthermore, the interference from mobile base stations may cause interference to MSS space stations “visible” at a low elevation angle. Thus, if a country were to deploy a cellular or similar high density system, harmful interference would be caused to MSS space stations located at a longitude with a large separation from the MS system, which could be providing service to another country or region of the world. In cases where there is no “visible” satellite, no such interference would occur. However, an MSS satellite could be introduced at a “visible” orbital location before or after the mobile network is deployed and could suffer harmful interference. It is therefore concluded that, in general, sharing of such systems with the MSS is not feasible.

The band 1 668-1 675 MHz is likely to be used with the corresponding downlink MSS band, 1 518-1 525 MHz. In this downlink band, there are pfd limits in RR Article **21** applicable to certain defined geographic area between 71º W and 125º W. These limits effectively preclude operation of MSS systems in that geographic area and also result in some orbital restrictions on MSS space stations. The orbital and operational restrictions on the MSS that result from the limits in the downlink band are similar to those that would result from the unconstrained deployment of an MS system in the aforementioned area. Therefore, MSS uplink spectrum in the band 1 668-1 675 MHz could not be used in that geographic area and there would be no need to apply constraints on mobile systems operating in the same area in the band 1 670-1 675 MHz.

The exclusion of the third group of systems could be considered for the band 1 668.4-1 675 MHz, for reasons outlined above, however, there would be no value in applying such an exclusion in certain territories in North America where MSS operation is not feasible. The non-application of restrictions on mobile operations, if limited to this geographical area, would not result in significant constraints for the MSS. The essence of the current *resolves* of Resolution **744 (WRC-03)** should be maintained.

In general it may be concluded that sharing between MSS and MS systems is difficult. If the band 1 668-1 675 MHz were to continue to be available for all MS applications, it would likely prevent use of the same band by the MSS, including MSS systems serving different geographical areas to the MS systems where visibility between the MS network and MSS satellite exists. However, as there is currently little actual use of this band for mobile systems, it would be possible to place some sharing conditions on the MS that would provide some protection to future MSS operations.

3/1.7/3 Methods to satisfy the agenda item

3/1.7/3.1 Issue A

Three different methods may be considered. Under each of Methods A1 and A2, there are two variations.

Method A1a

The existing coordination trigger (based on frequency overlap) would be complemented by a coordination threshold based on the e.i.r.p. of an MES of 2.2 dBW/4 kHz. This approach would consequently cap the protection that would be provided to new SRS (passive) systems.

Advantages:

– Would allow the only known planned S-VLBI system in this band to be adequately protected from interference from two types of MES considered in the studies.

− Coordination is likely to be feasible for all types of MESs.

– Would limit the extent to which MSS operations in this band could be constrained by a future S-VLBI system with more severe protection requirements than the current planned system.

Disadvantages:

– If a new S-VLBI system is developed in the future with more sensitive characteristics or lower orbit than the currently planned Radioastron system, it would receive interference above the level detrimental for radio astronomy.

− If there are no SRS (passive) systems which request coordination, the MSS system would not have any coordination constraints. Subsequent SRS (passive) systems would not receive protection from interference from pre-existing MSS systems irrespective of the coordination trigger value.

− May not ensure adequate protection of the currently planned Radioastron system from "handheld" type MESs if the worst-case operational parameters are considered.

Method A1b

This method is the same as Method A1a, except that a special regulatory provision related to coordination between MSS and SRS(passive) systems would be applied, for example as shown in § 3/1.7/4. With this method, the advantages applicable to Method A1a would remain, but the disadvantages would reduce to:

Disadvantages:

– If a new S-VLBI system is developed in the future with more sensitive characteristics or lower orbit than the currently planned Radioastron system, it would receive interference above the level detrimental for radio astronomy.

− May not ensure adequate protection of the currently planned Radioastron system from "handheld" type MESs if the worst-case operational parameters are considered.

Method A2a

The existing coordination trigger (based on frequency overlap) would be complemented by a coordination threshold based on the total power delivered to an MES antenna of 1.5 dBW.

Advantages:

– Would ensure adequate protection to the only known planned S-VLBI system in this band.

– Would limit the extent to which MSS operations in this band could be constrained by a future S-VLBI system with more severe protection requirements than the current planned system.

− Coordination is likely to be feasible for all types of MESs.

Disadvantages:

– If a new S-VLBI system is developed in the future with more sensitive characteristics or lower orbit than the currently planned Radioastron system, it would receive interference above the level detrimental for radio astronomy.

– If there are no SRS (passive) systems which request coordination, the MSS system would not have any coordination constraints. Subsequent SRS (passive) systems would not receive protection from interference from pre-existing MSS systems irrespective of the coordination trigger value.

Method A2b

This method is the same as Method A2a, except that a special regulatory provision related to coordination between MSS and SRS(passive) systems would be applied, for example as shown in § 3/1.7/4. With this method, the advantages applicable to Method A2a would remain, but the disadvantages would reduce to:

Disadvantages:

– If a new S-VLBI system is developed in the future with more sensitive characteristics or lower orbit than the currently planned Radioastron system, it would receive interference above the level detrimental for radio astronomy.

Method A3

The maximum e.i.r.p. of MESs operating in the GSO MSS networks would be limited to −4 dBW/4 kHz and the power delivered to the MES antenna would be limited to −11.5 dBW/4 kHz in any part of the frequency band 1 668-1 668.4 MHz.

There may be other parameter values and also alternative parameters (for example the total power delivered to an MES antenna) that would achieve the same protection of SRS (passive) systems as those above. Some administrations have proposed that the power spectral density delivered to the MES antenna could be −7.4 dBW/4 kHz, while retaining the maximum e.i.r.p. spectral density of −4 dBW/4 kHz. Other administrations have not accepted this proposal based on the results of simulations.

Advantages:

– The Radioastron and any future SRS (passive) systems with orbital parameters similar to those of Radioastron system will be adequately protected from interference produced by MESs of GSO MSS networks operating in the frequency band 1 668-1 668.4 MHz.

– One of the considered types of MES of future GSO MSS (E-s) networks will be able to operate in the frequency band 1 668-1 668.4 MHz.

– There are no requirements for coordination between MSS and SRS (passive).

Disadvantages:

– The two other MES types considered in the studies will not be able to operate in the frequency band 1 668-1 668.4 MHz.

– Any future SRS (passive) systems with more sensitive characteristics or lower orbit than the current planned Radioastron system may not be adequately protected from interference produced by MESs of GSO MSS networks operating in the frequency band 1 668-1 668.4 MHz.

– In the event that, subsequent to the completion of the Radioastron mission, this band is not used by SRS (passive) systems, MSS systems would be unnecessarily constrained.

3/1.7/3.2 Issue B

Some countries have existing transportable radio-relay operations in the band and there are different approaches which may be considered to regulate the potential interference from transportable radio-relay systems. Three methods are proposed for consideration. All methods have in common that they would restrict the use of the band 1 668.4-1 675 MHz by stations in the MS to transportable radio-relay systems (with the exception of the administration included in the *resolves* of Resolution **744 (WRC-03)**), would suppress or modify RR No. **5.380,** and would modify Resolution **744 (WRC-03)**, as appropriate.

Method B1

The use of the MS allocation would be limited to transportable radio-relay systems (with the exception of the territory of the administration included in the resolves of Resolution **744 (WRC-03)**). A hard limit would be placed on the e.i.r.p. spectral density of transportable radio-relay stations, for example in Resolution **744 (WRC-03)**.

Advantages:

– Adequate protection of the MSS from interference from the MS for single entry interference cases.

– The non-application of restrictions on mobile operations, if limited to one territory of North America, would not results in significant constraints for the MSS.

Disadvantages:

– For a relatively small number of countries, which have existing transportable radio-relay systems, operation in the band 1 668.4-1 675 MHz would be severely constrained.

Method B2

The use of the MS allocation would be limited to transportable radio-relay systems (with the exception of the territory of the administration included in the resolves of Resolution **744 (WRC-03)**). Administrations would be encouraged to limit the e.i.r.p. spectral density in the direction of the geostationary arc to −27 dBW/4 kHz and this would encourage the transition of transportable radio-relay systems to alternative frequency bands.

Advantages:

– Would provide adequate protection to MSS space stations from interference from MS applications other than transportable radio-relay systems.

– May, over time, provide protection of the MSS from transportable radio-relay systems.

– Allows continued use of transportable radio-relay systems in those countries that have them.

Disadvantages:

– Adequate protection of MSS space stations from interference from transportable radio-relay systems is not assured, at least in the short term.

Method B3

The use of the MS allocation would be limited to transportable radio-relay systems (with the exception of the territory of the administration included in the resolves of Resolution **744 (WRC-03)**). But there would be no limit (mandatory or recommended) on the e.i.r.p. of transportable radio-relay stations.

Advantages:

– Would provide protection to MSS space stations from interference from MS applications other than transportable radio-relay systems.

– Allows continued use of transportable radio-relay systems in those countries that have them.

Disadvantages:

– Without a limit (mandatory or recommended) on the e.i.r.p. of transportable radio-relay stations, harmful interference would be caused to MSS space stations.

3/1.7/4 Regulatory and procedural considerations

3/1.7/4.1 Issue A

Methods A1a and A1b

The coordination threshold could be added to Table 5-1 of RR Appendix **5** as shown in the example text below.

MOD

TABLE 5-1 (*continued*) (Rev.WRC-0~~3~~7)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.13** GSO/non-GSO	A station in a GSO satellite network in the frequency bands for which a footnote refers to No. **9.11A** or No. **9.13**, in respect of any other non-GSO satellite network, with the exception of coordination between earth stations operating in the opposite direction of transmission	Frequency bands for which a footnote refers to No. **9.11A** or No. **9.13**	Bandwidths overlap For the band 1 668-1 668.4 MHz with respect to MSS network coordination with SRS (passive) networks, in addition to bandwidth overlap the e.i.r.p. of an MES in an MSS network exceeds 2.2 dBW in a reference bandwidth of 4 kHz	Check by using the assigned frequencies and bandwidths	

Methods A2a and A2b

The threshold value of 1.5 dBW for the total power delivered to an MES antenna would be added to RR Appendix **5**, in addition to the threshold based on frequency overlap. This could be added to Table 5-1 of RR Appendix **5** as for Method A1 above, but with the following text in the column headed "Threshold/condition":

> For the band 1 668-1 668.4 MHz with respect to MSS network coordination with SRS (passive) networks, in addition to bandwidth overlap the power delivered to an MES antenna exceeds 1.5 dBW.

For Methods A1b and A2b, all MSS systems which exceed the threshold condition (Table 5-1 of Appendix **5**) in the band 1 668-1 668.4 MHz would be required to coordinate with SRS (passive) systems which have submitted advance publication information, received before 8 December 2005. This date is proposed to ensure that the Radioastron system (ITU filing name "SPECTR-R") is taken into account since the date of receipt of the advance publication information for that system is 7 December 2005. This proposal could be implemented by an addition to RR No. **5.379B**, for example:

MOD

5.379B The use of the band 1 668-1 675 MHz by the mobile-satellite service is subject to coordination under No. **9.11A**. In the band 1 668-1 668.4 MHz, mobile-satellite service systems that exceed the relevant coordination threshold condition shall be coordinated with any space research service (passive) system for which complete advance publication information was received by the Bureau prior to 8 December 2005, irrespective of the date of receipt of the coordination information. (WRC-0~~3~~7)

It should also be noted that SRS (passive) systems in the band 1 668-1 668.4 MHz are, and may continue to be, subject to coordination under Section II of Article **9**. Hence, it is necessary to update Appendix **4** to ensure that it meets the requirements for the provision of coordination information for SRS (passive) systems in the band 1 668-1 668.4 MHz. A similar issue is being considered under Agenda item 1.12.

Method A3

Under this method, the following footnote could be added in RR Article **5**. It would also be necessary under this method to withdraw the coordination requirement between SRS (passive) and MSS in the band 1 668-1 668.4 MHz as currently given in RR Appendix **5**.

ADD

5.SSS In order to protect the space research service (passive) in the band 1 668-1 668.4 MHz the maximum e.i.r.p. of mobile earth stations in a GSO network of the mobile-satellite service operating in this band shall not exceed −4 dBW in any 4 kHz and the power delivered to the MES antenna shall not exceed −11.5 dBW in any 4 kHz.

3/1.7/4.2 Issue B

RR No. **5.380** could be suppressed, or, if it is decided by WRC-07 to retain RR No. **5.380** with respect to the band 1 800-1 805 MHz only, it could be revised as shown below. Also there are no known aeronautical public correspondence systems in the bands 1 670-1 675 MHz and 1 800-1 805 MHz, and hence there are no apparent consequences on existing services if RR No. **5.380** is suppressed or modified.

MOD

5.380 The band~~s 1 670-1 675 MHz and~~ 1 800-1 805 MHz is~~are~~ intended for use, on a worldwide basis, by administrations wishing to implement aeronautical public correspondence. The ~~use of the band 1 670-1 675 MHz by stations in the systems for public correspondence with aircraft is limited to transmissions from aeronautical stations and the~~ use of the band 1 800-1 805 MHz is limited to transmissions from aircraft stations.

Method B1

For Method B1, to limit the use of the band 1 668.4-1 675 MHz only to transportable radio-relay systems, the *resolves* of Resolution **744 (WRC-03)** could be revised, as shown in the example below.

It has been suggested that Canada's name could be added to the *resolves* of Resolution **744 (WRC-03)**. Bearing in mind the constraints that apply to the MSS as a consequence of the existing provisions applicable to the territory of the United States in the band 1 518-1 525 MHz (see RR Article **21**), which result in restrictions on the orbital locations available to MSS networks, the addition of this particular country, due to its geographical location, would have negligible additional impact on MSS operations. However the studies have shown that if other territories were to be included, the impact on MSS operations would be very severe: not only preventing MSS operations within those territories, but also preventing MSS operations in other geographical areas and leading to further constraints on the orbital locations available for MSS networks.

MOD

RESOLUTION 744 (Rev.WRC-07~~3~~)

resolves

1 that, the use of the band 1 668.4-1 675 MHz by systems in the mobile service is limited to transportable radio-relay systems;

2 that, administrations operating such systems shall limit the e.i.r.p. spectral density radiated in the direction of the geostationary arc to –27 dBW/4 kHz in this band;

3 that, in the band 1 670-1 675 MHz, stations in the MSS shall not claim protection from fixed and mobile stations ~~operating within the United States of America~~operating in Canada and the United States of America~~,~~;

4 that *resolves* 1 and 2 do not apply to fixed and mobile stations operating in Canada and the United States of America,

Method B2

For Method B2, the *resolves* of Resolution **744 (WRC-03)** could be revised, as shown above, but with *resolves* 2 replaced by the following:

2 that, administrations operating such systems should limit the e.i.r.p. spectral density radiated in the direction of the geostationary arc to –27 dBW/4 kHz in this band;

Method B3

For Method B3, the same revisions to Resolution **744 (WRC-03)** as for Method B1 could be used, but without *resolves* 2.

For all three methods it may be necessary to consider the potential situation that an administration could notify and operate transportable radio-relay systems as part of the fixed service, for which no restrictions would apply, thus avoiding the proposed limitations.

3/1.7/4.3 Other considerations for both Issues A and B

On the basis that the studies related to the two issues are complete, it will be necessary to modify Resolution **744 (WRC-03)**. In particular the *invites ITU-R*, *invites administrations and interested parties* and *recommends* will no longer be required.

Agenda item 1.9

"to review the technical, operational and regulatory provisions applicable to the use of the band 2 500-2 690 MHz by space services in order to facilitate sharing with current and future terrestrial services without placing undue constraint on the services to which the band is allocated"

NOTE – There is no corresponding WRC Resolution for this agenda item.

Additional material relevant to this section of the CPM Report can be found in Annex 2 of the JTG 6-8-9 Chairman's Report (Document JTG 6-8-9/125, 31 July 2006).

Executive summary

The ITU-R has conducted sharing studies between various space services and terrestrial services to which the band 2 500-2 690 MHz is allocated on a primary basis with a view to propose methods to satisfy this agenda item. The studies were performed taking into account the most recent characteristics for terrestrial services as well as space services.

There are three possible methods:

– *Method A* – PFD limits applicable to all space services;

– *Method B* – PFD limits for certain space services and coordination thresholds for mobile-satellite services;

– *Method C* – coordination thresholds for all space services;

as well as a complementary method on regulatory limitation to the MSS service, which can be applied in conjunction with each of the other methods.

In all cases, it was agreed that the regulatory issues for BSS (sound) systems subject to RR Nos. **5.417A** and **5.418** in relation to terrestrial services were resolved at WRC-03 and that it was thus unnecessary to further consider this matter.

For each of the methods above, it was not possible to agree within the ITU-R on one suitable PFD mask (limits or coordination thresholds) that would to be applied to space services in the band 2 500-2 690 MHz to facilitate sharing with current and future terrestrial services without placing undue constraints on the services to which the band is allocated on a co-primary basis. However, a range of PFD values is provided in this section of the CPM text for further consideration by WRC-07.

3/1.9/1 Background

3/1.9/1.1 Current allocations in the band 2 500-2 690 MHz

Within the band 2 500-2 690 MHz, there are primary allocations to the fixed service (FS) and mobile service (MS), including an identification for IMT-2000. In a single country there is also an allocation to the radiolocation service (RLS) on a primary basis.

There are also primary allocations to the fixed-satellite service (FSS), the broadcasting-satellite service (BSS) (limited to national and regional systems for community reception), the broadcasting-satellite service (sound) (BSS (sound)) within the band above in various footnotes, the aeronautical mobile-satellite service (AMSS), the mobile-satellite service (MSS) and in two countries the radiodetermination-satellite service (RDSS). There are also secondary allocations to the radio-astronomy service (RAS) as well as to the Earth exploration-satellite service (passive) and space research services (passive).

3/1.9/1.2 Current regulatory regime and relevant Resolutions impacting sharing between space and terrestrial services

The current regulatory regime for sharing between space and terrestrial services is a combination of pfd limits (which are contained either in RR Article **21**, in footnotes of Article **5**, or in WRC Resolutions), pfd coordination triggers (contained in Appendix **5** or in footnotes of Article **5**, or in WRC Resolutions) and coordination aspects, e.g. Article **9**.

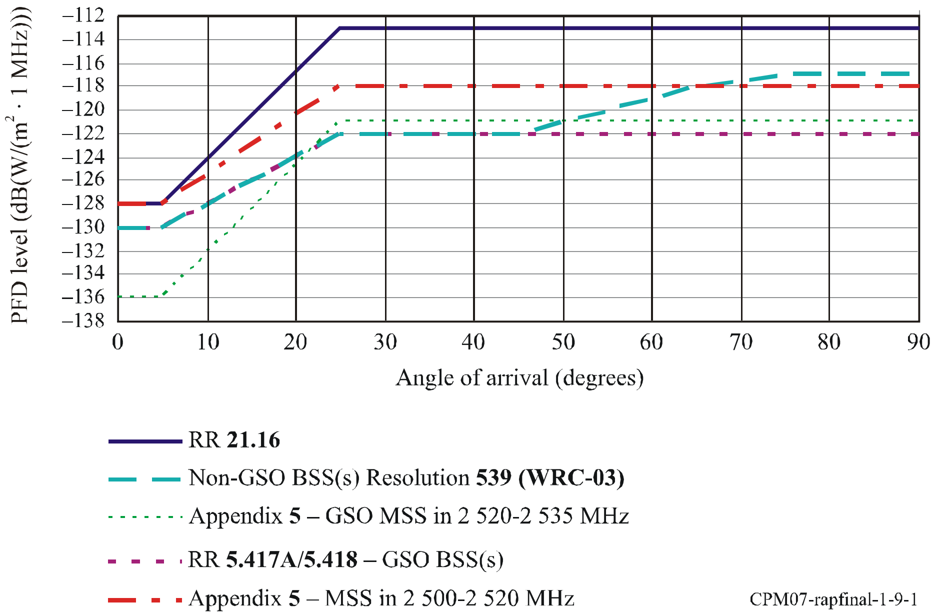
The FSS is subject to pfd limits in Table **21-4** (RR Article **21**, No. **21.16**). The BSS (except BSS (sound) in RR Nos. **5.417A** and **5.418**) is subject to the same pfd limits. Similarly, identical limits apply to the RDSS.

The MSS is subject to agreement obtained under RR No. **9.21** in the bands 2 520-2 535 MHz and 2 655-2 670 MHz (see RR Nos. **5.403** and **5.420**). The MSS in the band 2 500-2 535 MHz is also subject to RR No. **9.11A** for coordination with respect to terrestrial services under RR No. **9.14** if the thresholds contained in RR Appendix **5** are exceeded. Different threshold values are provided depending on whether the satellite is GSO or non-GSO and dependant also on the frequency band. The BSS (sound) has allocations in those Region 3 countries listed in RR Nos. **5.418** and **5.417A**. The pfd limits apply except in a limited area around the national territory where coordination under RR No. **9.11** applies (see RR Nos. **5.418** and **5.417A** and Resolution **539 (Rev.WRC-03)**). It should be noted that the pfd limits specified in RR No. **5.418** apply to the BSS (sound) system for which complete Appendix **4** coordination information has been received after 1 June 2005.

The pfd limits and coordination triggers for these various space services are illustrated in Fig. 1.9-1.

FIGURE 1.9-1

Illustration of current pfd limits and coordination triggers applicable to space services



Sharing between BSS (sound) systems and terrestrial systems has been thoroughly studied and concluded under WRC-03 Agenda item 1.34 and was reflected in footnotes RR Nos. **5.418** and **5.417A** and Resolution **539 (Rev.WRC-03)**.

It has been verified that for the range, 45° to 90°, of angles of arrival of the incident wave above the horizontal plane the pfd values for GSO BSS (sound) network under RR Nos. **5.417A** and **5.418** in respect to terrestrial systems are lower than those for non-GSO BSS (sound) systems under Resolution **539 (Rev.WRC-03)** by at maximum 5 dB.

3/1.9/2 Summary of technical and operational studies and relevant ITU-R Recommendations

Many administrations have implemented or are planning to implement fixed and/or mobile systems in the whole band and satellite systems in those portions of the band 2 500-2 690 MHz that are allocated to FSS, MSS, RDSS and BSS. The ITU-R studies have considered a wide range of existing and planned terrestrial systems in the FS (point-to-point and point-to multipoint) including electronic news gathering – outside broadcast (ENG-OB) and in the MS (IMT-2000 and non-IMT-2000 systems). These studies also considered a wide range of existing and planned satellite systems in the FSS, MSS (including the satellite component of IMT-2000) and BSS.

3/1.9/2.1 Summary of studies

Table 1.9-1 provides the summary of the ITU-R studies of interference from space stations into terrestrial stations including the key assumptions and results. Some administrations do not agree with all the assumptions.

Another study has been conducted by one administration to evaluate the pfd levels based on the existing MSS system parameters in the bands 2 500-2 535 MHz and 2 655-2 690 MHz under the current RR provisions (RR Nos. **5.403**, **5.414**, **5.419** and **5.420**). According to that study, it is not feasible for this system to operate within a pfd mask ensuring that I_{sat}/N_{th} is not exceeded for all (or almost all) the terrestrial stations. The results of the analysis indicate that for space systems designed for national use, a well-shaped satellite antenna beam may reduce the number of countries with which the coordination procedure is required. Some administrations had other views than those in that study.

3/1.9/2.2 Relevant ITU-R Recommendations

Recommendations ITU-R M.1036, ITU-R M.1645, ITU-R M.1646, ITU-R F.1763, ITU-R F.1777, ITU-R F.1336-1 and ITU-R F.1336-2.

TABLE 1.9-1

Summary of the assumptions and analysis of the various studies

	Study 1 (ENG)	**Study 2 (Fixed and non-IMT-2000)**	**Study 3 (IMT-2000 mobile stations and base stations)**	**Study 4 (IMT-2000 mobile stations and base stations)**	**Study 5 (IMT-2000 mobile stations and base stations)**	**Study 6 (non-IMT-2000 mobile stations and base stations)**	**Study 7 (point-to-multipoint terrestrial system: MCS)**
I_{sat}/N_{th} criteria (dB) [1]	−6	−10	−10	−10	−10	−10	−10
Max antenna gain (dBi) with feeder losses	15.5	18.15 for base station 7 for CPE [2] station	16 for base station 0 for mobile station	16 for base station 0 for mobile station	18 for sectorized base station 10 for omnidirectional base station 0 for mobile station	16 for base station 0 for mobile station	16 for base station 13 for outdoor CPE or 2 for omni CPE
Number of sectors	6 for central site	4 for base stations	3 for base stations	3 for base stations	3 for sectorized base stations	3 for base stations	1 to 4
Vertical antenna pattern or specific antenna used	Recommendation ITU-R F.1336-1 with k = 0.025	Andrew DMA 18W090-H for base stations Navini for CPE station	Recommendation ITU-R F.1336-1 with k = 0.2 Omni for mobiles	Recommendation ITU-R F.1336-1 with k = 0.2 Omni for mobiles	Recommendation ITU-R F.1336-1 with k = 0.2 Omni for mobiles	Recommendation ITU-R F.1336-2 with k = 0.2 (average) for base stations [3] Omni for mobiles	Tiltek 2504-8-80 for base stations Actual measured for CPE
Downtilt (degrees) for base stations	2.5	1	2.5	2.5	2.5 for sectorized base station 0 for omnidirectional base station	2.5	3 for base stations

[1] Some administrations do not agree with −10 dB I_{sat}/N_{th} value in the assumptions.

[2] CPE: Customer premises equipment.

[3] Although the average pattern has been used for this study; some administrations are of the view that the peak pattern is appropriate under Agenda item 1.9.

TABLE 1.9-1 (*continued*)

	Study 1 (ENG)	**Study 2 (Fixed and non IMT-2000)**	**Study 3 (IMT-2000 mobile stations and base stations)**	**Study 4 (IMT-2000 mobile stations and base stations)**	**Study 5 (IMT-2000 mobile stations and base stations)**	**Study 6 (non IMT-2000 mobile stations and base stations)**	**Study 7 (point-to-multipoint terrestrial system: MCS)**
Noise figure (dB)	2.5	3 for base station 5 for CPE station	2.5 for base station 7 for mobile station	2.5 for base station 7 for mobile station	2.5 for base station 7 for mobile station	4 for base station 5 for mobile station	4 for base station 4 for CPE
Area studied	Study on Australian country**	Study on continental USA without Alaska	Asia	Worldwide in 6 regions	Australia	Asia	Canada**
Polarization loss (dB)	Agreed model	Agreed model	Agreed model	Agreed model	Agreed model	Agreed model	1.7 dB [4]
Type of satellite system (coverage)	Global	Global	Global	Global	Global	Global	Global
Satellites scenario	3 GSO + 1 non-GSO*	3 GSO + 1 non-GSO	3 GSO	3 GSO + 1 non-GSO	3 GSO	3 GSO + 1 non-GSO	3 GSO
Terrestrial stations distribution used for the simulations	All azimuth at 11 specific sites against 3 satellite orbital positions	Uniform distribution over continental large country spaced at 125 km	Uniform distribution every 2° in latitude and longitude	Uniform distribution every 1° in latitude and longitude averaging over 6 continents	9 000 IMT base stations, with uniformly distributed azimuth orientations	Uniform distribution every 1° in latitude and longitude	Uniform distribution every 1° in latitude and longitude
pfd mask dB(W/m^2 · MHz) [5] (before the sensitivity analysis)***	−134/−117	−139/−119 for base stations −128/−127 for out-stations	−140/−137 for base stations −128/−122 for mobile stations	−138/−128 for base stations −125/−125 for mobile stations	−138/−122 for sectorized base stations −122/−122 for mobile stations	−137/−127 for base stations −132/−125 for mobile stations	−133/−123 for base stations and CPE

[4] A polarization loss of 1.7 dB was applied in all elevation angles.

[5] pfd mask meets the assumed I/N_{th} criteria.

TABLE 1.9-1 (*end*)

	Study 1 (ENG)	**Study 2 (Fixed and non IMT-2000)**	**Study 3 (IMT-2000 mobile stations and base stations)**	**Study 4 (IMT-2000 mobile stations and base stations)**	**Study 5 (IMT-2000 mobile stations and base stations)**	**Study 6 (non IMT-2000 mobile stations and base stations)**	**Study 7 (point-to-multipoint terrestrial system: MCS)**
pfd mask dB(W/m^2 · MHz) and consequent percentage of stations where I_{sat}/N_{th} criteria is exceeded (after the sensitivity analysis)***	−130/−116 with 6.5%*	−136/−122 with 5.5% for base stations 4.9% for CPE stations	−130/−124 [6] with 8.4% for base stations 0% for mobile stations	−133/−125 with 2.2% for base stations 0% for mobile stations	−136/−122 with 2.0% for sectorized base stations 0% for mobile stations	−132/−124 with 2% for base stations 7.2% for mobile stations	−133/−123 with 0.2% for outdoor CPE 2.3% for base stations

* The elements provided are related to one particular scenario studied. Removing the middle GSO results in an example pfd mask 1 dB less stringent. Removing the non-GSO results in an example pfd mask 2 dB less stringent.

** Results in these studies are based on terrestrial systems in operation.

*** First pfd value applies to angles below 5°, second pfd value applies to angles between 25° and 90°, with linear interpolation between 5° and 25°.

[6] In Study 3, the results presented in the table are for the entire area considered but there are additional study results in the contribution that excludes the area having arrival angles below 5°, the sea area, the area above 65° latitude.

3/1.9/3 Analysis of the results of studies

It was decided that under Agenda item 1.9 there was no need to conduct further studies in ITU-R on sharing between the broadcasting satellite service (sound) (subject to RR Nos. **5.417A** or **5.418**) and terrestrial services in the 2 605-2 655 MHz band as decisions on this sharing situation were taken by WRC-03.

The studies carried out by ITU-R under this agenda item and which formed the basis for pfd values in Table 1.9-1 did not address the interference from terrestrial services into space services.

Because of the different types of terrestrial systems deployed, or intended to be deployed, in the 2 500-2 690 MHz band, the studies have shown that the requirements of all systems operating in any of the terrestrial services sharing this band should be taken into account.

As a consequence of the Agenda item 1.9, the pfd mask to be applied to the space services may be modified. Depending on the values defining the new mask, some constraints may apply, either on the terrestrial services, or the space services, or both.

Table 1.9-2 summarizes typical constraints for terrestrial systems, caused by interference from space systems. Table 1.9-3 summarizes typical constraints for satellite systems caused by regulatory restrictions under sharing environments with terrestrial systems.

TABLE 1.9-2

Terrestrial system constraints caused by interference from space stations

	Direct constraint (technical aspect)	**Consequential constraint (operational aspect)**	**Potential mitigation measures**
P-MP/cellular application (FS, MS)	Transmission quality degradation due to the increased external interference	Coverage reduction	– Deployment of additional base stations – Use of a large size antenna – Use of an antenna with a better elevation pattern
P-P/back-haul application (FS)		Link length reduction	– Deployment of additional stations – Use of a large size antenna – Use of an antenna with a better elevation pattern
Analogue/digital ENG (FS, MS)		Operation range reduction	– Construction of additional central receive sites or repeater facilities

TABLE 1.9-3

Satellite system constraints due to a proposed reduction of pfd under sharing environments with terrestrial systems

	Direct constraint (technical aspect)	Consequential constraint (technical/operational aspect)	Potential mitigation measures
Satellite systems	Operation with lower e.i.r.p./e.i.r.p. density	– Coverage reduction – Transmission quality degradation – Use of possibly unrealistically larger antenna at the earth station	– Use of improved satellite antenna (roll-off outside service area) – Use of a larger antenna at the earth station – Use of lower noise amplifier at the earth station in certain situations

Undue constraints may conceivably occur, when the application of the mitigation measures to compensate these constraints is, for example, difficult (or impossible) in technical/operational aspects or requires significant resources. The extent of constraints reaching undue level may differ depending on the systems as well as their operational conditions.

3/1.9/3.1 Views of administrations on the analysis of the results of studies

Some administrations are of the view that the ITU-R studies have shown that the current levels of power flux-density applicable to space stations having allocations in the 2 500-2 690 MHz band do not allow terrestrial systems to operate without undue constraints and do not facilitate sharing between space and terrestrial systems. As a consequence, and taking into account that no studies have shown that a pfd level reduction would produce undue constraints on space systems, they propose that these levels of pfd be reduced in order to setup a fair and balanced solution.

Some other administrations are of the view that the current pfd levels provide a fair and balanced solution for sharing and would satisfy the agenda item and not impose undue constraints and, furthermore, the new levels from ITU-R studies would not facilitate sharing between space and terrestrial systems.

3/1.9/4 Methods to satisfy the agenda item

3/1.9/4.1 General considerations

In the course of the studies within ITU-R the following considerations were discussed and accepted:

– It is recognized that a pfd limit regulatory regime, based on the specification of a power flux density mask in Article **21**, ensures the long-term protection of terrestrial systems in the band 2 500-2 690 MHz from satellite interference, without the need for coordination between space stations and terrestrial stations. Such a regime would also be beneficial to the long-term development of space services as a defined set of pfd limits would be known, as long as such limits do not impose undue constraints on the services to which the band is allocated on a co-primary basis.

– Noting the advantage of the above item, pfd values for a coordination threshold may also be considered if it is not possible to derive suitable pfd limits that are both sufficient to protect terrestrial services and allow for the operation of space services.

– For studies being undertaken, the most up-to-date common characteristics for terrestrial and satellite systems need to be used in assessing sharing conditions.

– Studies were carried out with the understanding that the technical, operational and regulatory provisions applicable to terrestrial services were not to be considered. It is understood that, with sharing between space and terrestrial services based on a set of pfd limits or coordination thresholds, existing and future terrestrial systems will need to accept the levels of interference associated with these pfd values. As a result, certain technical and/or operational limitations may be inherent in the consideration of these pfd levels. However, no new regulatory provisions applicable to the terrestrial services, nor modifications to the current regulatory provisions for terrestrial services would be required in the RR.

– It should be emphasized that the RR do not prevent a space system from producing pfd levels above any limits or thresholds over the territory of the administration which notified this system and any administration that has so agreed (see, e.g. RR No. **21.17**[1]).

– In the band 2 500-2 690 MHz, it is not technically feasible to operate MSS and terrestrial services systems on co-frequency basis in the same geographical area.

3/1.9/4.2 Methods

3/1.9/4.2.1 Method A

1) To apply a power flux-density (pfd) limits in RR Article **21** to all space services[2], except BSS (sound) under RR Nos. **5.418**, **5.417A** and Resolution **539 (Rev.WRC-03)**, having an allocation in the frequency band 2 500-2 690 MHz.

2) Set these pfd limits to the following values, in dB(W/(m^2 · MHz)):

X for $0° \le \theta \le 5°$

$X + (Y - X)/20 * (\theta - 5)$ for $5° \le \theta \le 25°$

Y for $25° \le \theta \le 90°$

[1] NOTE – When applying RR No. **21.17**, certain conditions need to be observed.

[2] This method would not preclude the possibility to negotiate and obtain the agreement of the administrations concerned to a pfd level exceeding the limit over their territory (see RR No. **21.17**).

with θ the angle of arrival above the horizontal plane and where:

$$-140 \leq X \leq -128^*$$

$$-137 \leq Y \leq -113^*$$

* Values in current RR Table **21-4**.

Based on analysis of the results of studies (see Table 1.9-1), some administrations are of the view that a low/high angle (*X*/*Y*) dBW/m^2/MHz PFD mask of –133/–125 is suitable whilst some others believe that a mask of –136/–122 is suitable. These administrations are of the view that the two masks are a balanced solution that shares the constraints between space and terrestrial services.

Some other administrations believe the aforementioned values do not take into account the impact on space services and hence the current limits, namely –128/–113 as currently specified in Article **21** within this frequency band, are appropriate.

Advantages:

– Beneficial to the long-term development of all services, as long-term regulatory protection through the use of a defined set of pfd limits removes an important element of uncertainty affecting potential investment decisions.
  - Defined protection at specified interference levels to terrestrial systems
  - Regulatory certainty for space systems with respect to terrestrial services
  - There is no requirement for administrations to engage in coordination with significant resource and cost savings for both parties as a result.

– Defines a clear and concise sharing framework between space and terrestrial systems.

Disadvantages:

– There is less flexibility for the space services to obtain agreement for a higher pfd level if required (however, see footnote 8).

– There may be an impact and possible constraint on the design and operation of space stations having beams covering large areas and small earth terminals, depending on the values.

– It is very difficult or impractical for space services to meet the pfd limits in neighbouring countries when more stringent pfd limits than those currently existing in RR Article **21** are applied.

3/1.9/4.2.2 Method B

Under this method, the new pfd mask in RR Table **21-4** pfd mask in dB(W/(m^2 · MHz)) (the same one as used under Method A) needs to apply to FSS systems in the band 2 500-2 690 MHz, RDSS systems in the band 2 500-2 516.5 MHz (in accordance with RR No. **5.404**), and BSS systems in the band 2 520-2 670 MHz (in accordance with RR No. **5.416**),except for the BSS (sound) systems pursuant to RR Nos. **5.417A**, **5.418** and Resolution **539 (Rev.WRC-03)**.

However, for MSS systems in the bands 2 500-2 520 MHz and 2 520-2 535 MHz (in accordance with RR Nos. **5.414** and **5.403**, respectively), the following pfd threshold values in dB(W/(m^2 · MHz)) would be used in Table 5-2 of RR Appendix **5**:

$$X \quad \text{for} \quad 0° \le \theta \le 5°$$

$$X + (Y - X)/20 * (\theta - 5) \quad \text{for} \quad 5° \le \theta \le 25°$$

$$Y \quad \text{for} \quad 25° \le \theta \le 90°$$

with θ the angle of arrival above the horizontal plane and where:

$$-140 \le X \le -136^*/-128^*$$

$$-137 \le Y \le -121^*/-118^*$$

* Values of current RR Appendix **5**, in 1 MHz, applying to GSO MSS space stations for the ranges 2 520-2 535 MHz and 2 500-2 520 MHz respectively.

Advantages:

– Would adequately protect, in most cases, systems in the terrestrial services to which the band 2 500-2 690 MHz is allocated.

– Would facilitate frequency sharing between MSS systems and systems in the terrestrial services to which the bands 2 500-2 535 MHz and 2 655-2 690 MHz are allocated.

Disadvantages:

– There may be an impact on the design and operation of FSS systems and BSS systems.

– Some coordination efforts may be needed between MSS space stations and terrestrial stations in the band 2 500-2 535 MHz:

  – Since the interfering effect into terrestrial services from the space station for FSS, BSS or MSS having the same pfd value on the Earth's surface, would be the same, this method may not be a workable solution for terrestrial systems in the countries which are neighboured to the country having MSS system.

  – An administration which has not commented within four months of the publication of a MSS system would be deemed to have accepted the interference. Depending on the excess pfd radiated by the MSS space station, this may preclude the deployment of terrestrial services in countries not responding in a timely manner to such publications.

– An administration planning to deploy terrestrial stations may object to the MSS system only on the basis of the characteristics of its terrestrial stations already in service or to be brought into service within three years of the publication of the MSS system in accordance with RR Appendix **5**. RR No. **9.50.2** offers the possibility to extend this period, but only by mutual agreement. Therefore, this method may not ensure the long-term protection of terrestrial systems in the band 2 500-2 690 MHz.

– In case of disagreement, the application of RR No. **11.41** by the MSS system leads to an unclear situation as to the effective level of protection given to the terrestrial services of the administration which has not agreed.

– Extra resource and cost implications to both satellite and terrestrial operators and administrations.

3/1.9/4.2.3 Method C

To define the following coordination threshold levels in dB(W/($m^2 \cdot$ MHz)) to be applied to the space services (except BSS(s) under RR Nos. **5.418**, **5.417A** and Resolution **539 (Rev.WRC-03)**), having an allocation in the frequency band 2 500-2 690 MHz:

$$X \quad \text{for} \quad 0° \le \theta \le 5°$$
$$X + (Y - X)/20 * (\theta - 5) \quad \text{for} \quad 5° \le \theta \le 25°$$
$$Y \quad \text{for} \quad 25° \le \theta \le 90°$$

with θ the angle of arrival above the horizontal plane and where:

$$-140 \le X \le -136^*/-128^*$$
$$-137 \le Y \le -121^*/-118^*$$

* Values of current RR Appendix **5** (in 1 MHz) applying to GSO MSS space stations for the range 2 520-2 535 MHz and 2 500-2 520 MHz respectively.

Advantages:

– There may be less impact and constraint on the design and operation of space systems.

Disadvantages:

– Some coordination efforts may be needed between space stations and terrestrial stations.

– This may not be a workable solution for satellite systems intending to cover very large geographical areas encompassing the territories of many countries.

– An administration which has not commented within four months of the publication of a space system would be deemed to have accepted the interference. Depending on the excess pfd radiated by the space station, this may preclude the deployment of terrestrial services in countries not responding in a timely manner to such publications.

– An administration planning to deploy terrestrial stations may object to the MSS system only on the basis of the characteristics of its terrestrial stations already in service or to be brought into service within three years of the publication of the MSS system in accordance with RR Appendix **5**. RR No. **9.50.2** offers the possibility to extend this period, but only by mutual agreement. Therefore, this method may not ensure the long-term protection of terrestrial systems in the band 2 500-2 690 MHz.
– In case of disagreement, the application of RR No. **11.41** by the space system leads to an unclear situation as to the effective level of protection given to the terrestrial services of the administration which has not agreed.
– Extra resource and cost implications to both satellite and terrestrial operators and administrations.

3/1.9/4.2.4 Complementary Method to be considered with Methods A, B and C

The MSS downlink allocation in band 2 500-2 520 MHz would be limited to national and regional systems only.

NOTE − This method should be considered in conjunction with Methods A, B and C.

Advantages:

– Recognizing that in the band 2 500-2 690 MHz, it is not technically feasible to operate MSS and terrestrial services systems on co-frequency basis in the same geographical area, restricting MSS to national and regional systems would not constrain MSS.

Disadvantages:

– Opportunity for developing MSS systems with coverage wider than national and regional would be denied.

3/1.9/5 Regulatory and procedural considerations

It is noted that the final regulatory provisions decided by the conference may specifically address the dates at which changes in those regulatory provisions become applicable, taking into account the needs of existing and planned satellite systems.

NOTE – The following modifications to the footnotes in RR Article **5** may be necessary to implement in all methods.

Some administrations have difficulties with some of the following regulatory examples.

3/1.9/5.1 Method A

To implement Method A, the following amendments to RR Article **5**, Article **21** and Appendix **5** would be necessary:

MOD

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

MOD

5.403 Subject to agreement obtained under No. **9.21**, the band 2 520-2 535 MHz ~~(until 1 January 2005 the band 2 500-2 535 MHz)~~ may also be used for the mobile-satellite (space-to-Earth), except aeronautical mobile-satellite, service for operation limited to within national boundaries. The provisions of No. **9.11A** apply.

MOD

5.414 The allocation of the frequency band 2 500-2 520 MHz to the mobile-satellite service (space-to-Earth) ~~shall be effective on 1 January 2005 and~~ is subject to coordination under No. **9.11A**.

MOD

5.415 The use of the bands 2 500-2 690 MHz in Region 2 and 2 500-2 535 MHz and 2 655-2 690 MHz in Region 3 by the fixed-satellite service is limited to national and regional systems~~,~~ subject to agreement obtained under No. **9.21**, giving particular attention to the broadcasting-satellite service in Region 1. ~~In the direction space-to-Earth, the power flux-density at the Earth's surface shall not exceed the values given in Article **21**, Table **21-4**~~.

MOD

5.419 ~~The allocation of the frequency band 2 670-2 690 MHz to the mobile-satellite service shall be effective from 1 January 2005.~~ When introducing systems of the mobile-satellite service in ~~this~~the band 2 670-2 690 MHz, administrations shall take all necessary steps to protect the satellite systems operating in this band prior to 3 March 1992. The coordination of mobile-satellite systems in the band shall be in accordance with No. **9.11A**.

MOD

5.420 The band 2 655-2 670 MHz ~~(until 1 January 2005 the band 2 655-2 690 MHz)~~ may also be used for the mobile-satellite (Earth-to-space), except aeronautical mobile-satellite, service for operation limited to within national boundaries, subject to agreement obtained under No. **9.21**. The coordination under No. **9.11A** applies.

MOD

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

Section V – Limits of power flux-density from space stations

TABLE **21-4** (WRC-0~~3~~7)

Frequency band	**Service***	**Limit in dB(W/m^2) for angles of arrival (δ) above the horizontal plane**			**Reference bandwidth**
		0°-5°	**5°-25°**	**25°-90°**	
2 500-2 690 MHz 2 520-2 670 MHz 2 500-2 516.5 MHz (No. **5.404**) 2 500-2 520 MHz 2 520-2 535 MHz (No. **5.403**)	Fixed-satellite Broadcasting-satellite Radiodetermination-satellite Mobile-satellite Mobile-satellite (except aeronautical mobile-satellite)	~~−152 [9]~~ [*X*]	~~−152 + 0.75(δ – 5) [9]~~ [*X*] + ([*Y*] − [*X*])/20 * (δ − 5)	~~−137 [9]~~ [*Y*]	~~4 kHz~~ 1 MHz

NOTE − This Table needs to be aligned with the values that are decided in terms of the methods.

MOD

APPENDIX 5 (Rev.WRC-0~~3~~7)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-2 (*continued*) (WRC-0~~3~~7)

NOTE − All information pertaining to frequency bands 2 500-2 520 MHz and 2 520-2 535 MHz should be removed from this Table.

3/1.9/5.2 Method B

To implement Method B, the following amendments to the current Radio Regulations would be necessary.

NOTE – The following footnotes would be changed in the same way as Method A.

5.403, **5.414**, **5.415**, **5.419** and **5.420**.

MOD

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

Section V – Limits of power flux-density from space stations

TABLE **21-4** (WRC-~~03~~07)

Frequency band	Service*	Limit in dB(W/m²) for angles of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
2 500-2 690 MHz 2 520-2 670 MHz 2 500-2 516.5 MHz (No. **5.404**)	Fixed-satellite Broadcasting-satellite Radiodetermination-satellite	~~–152~~ [9][*X*1]	[*X*1] + ([*Y*1]-[*X*1])/20*(δ – 5) ~~–152 + 0.75(δ – 5)~~ [9]	~~–137~~ [9][*Y*1]	4 ~~k~~1 MHz

NOTE – This Table needs to be aligned with the values that are decided in terms of the methods.

MOD

APPENDIX 5 (Rev.WRC-~~03~~07)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

TABLE 5-2 (*continued*) (WRC-~~03~~07)

Frequency band (MHz)	**Terrestrial service to be protected**	**Coordination threshold values**				
		GSO space stations		**Non-GSO space stations**		
		pfd (per space station) calculation factors (NOTE 2)		**pfd (per space station) calculation factors (NOTE 2)**		**% FDP (in 1 MHz) (NOTE 1)**
		P	***r* dB/ degrees**	***P***	***r* dB/ degrees**	
~~2 500-2 520~~	~~Analogue FS telephony (NOTE 5)~~	~~–146 dB(W/m^2) in 4 kHz and –128 dB(W/m^2) in 1 MHz~~	~~0.5~~	~~–146 dB(W/m^2) in 4 kHz and –128 dB(W/m^2) in 1 MHz~~	~~0.5~~	
2 500-2 520	All ~~other~~ cases	~~–128~~ [*X*2]dB(W/m^2) in 1 MHz	~~0.5~~([*Y*2]-[*X*2]) *0.05	– ~~128~~[*Y*2] dB (W/m^2) in 1 MHz	~~0.5~~([*Y*2]-[*X*2]) *0.05	25
~~2 520-2 535~~	~~Analogue FS telephony (NOTE 5)~~	~~–154 dB(W/m^2) in 4 kHz and –136 dB(W/m^2) in 1 MHz~~	~~0.75~~	~~–146 dB(W/m^2) in 4 kHz and –128 dB(W/m^2) in 1 MHz~~	~~0.5~~	
2 520-2 535	All ~~other~~ cases	~~–136~~[*X*3] dB(W/m^2) in 1 MHz	~~0.75~~([*Y*3~~2~~]-[*X*3~~2~~]) *0.05	~~–128~~[*Y*3] dB(W/m^2) in 1 MHz	~~0.5~~([*Y*3]-[*X*3]) *0.05	25

NOTE – This table needs to be aligned with the values that are decided in terms of the methods.

NOTE – The current values in Table 5-2 of Appendix **5** are based on Recommendation ITU-R M.1142, which addresses sharing between FS and MSS. Some administrations are of the view that the values provided in this Recommendation cannot be used as coordination criteria for MS and MSS. However, some other administrations are of the view that these values in the Table can be used in coordination between all the terrestrial services and MSS as was so decided by past Conference(s) and have been used as such.

3/1.9/5.3 Method C

NOTE − Table 5-2 of RR Appendix **5** and RR Table **21-4** need to be aligned with the regulatory provisions that are decided in terms of the methods. Also most of the footnote changes shown in Method A may also be needed for this method.

3/1.9/5.4 Complementary method which can be applied in conjunction with any one of Methods A, B and C

ADD

5.AAA The use of the band 2 500-2 520 MHz by the mobile-satellite service is limited to national and regional systems, subject to agreement obtained under No. **9.21**.

NOTE − This method should be considered in conjunction with Methods A, B and C.

3/1.9/5.5 Transitional and implementation arrangements

As well as considering methods to satisfy the agenda item, the CPM gave consideration to the transitional and implementation process that could be associated with these methods. In so doing account was taken of the different views of those administrations with terrestrial or satellite interests. Two alternative options are given below that WRC-07 may wish to consider when it is addressing issues associated with the entry into force and provisional application of decisions taken by the conference. Some administrations favour Option 1 and some other administrations favour Option 2.

In establishing Options 1 and 2 below and in order to reflect past practices, it was considered preferable to propose enacting new pfd limits via a WRC-07 Resolution referenced in RR Article **59**, rather than by indicating transitional arrangements in footnotes to the Table of Frequency Allocations in RR Article **5**.

The indications below as to the relevant dates at which the relevant revised provisions come into force are purely illustrative and will need to be decided by the Conference.

Options 1 and 2 are based on the implementation of Method A. They can equally serve as example suggested implementation options for other methods, with suitable adaptation, depending on the method chosen.

In addition to the above two options, some administrations suggested a third option indicating that transitional and implementation arrangements are an issue to be considered and decided by WRC-07, as appropriate, and not at the CPM.

3/1.9/5.5.1 Option 1

This option has been established on the understanding that the intent is not to subject satellite networks for which complete RR Appendix **4** coordination information has been received prior to the date of application of these provisions to these new pfd limits. Therefore, there is a need to explicitly state which pfd limits the Bureau will use when examining notifications of frequency assignments to those satellite networks.

This option ensures non-retroactive application of new pfd limits to the satellite networks which have already started their coordination process and also allows such networks to choose, as the date of bringing into use, any date within the regulatory period of seven years in RR No. **11.44**.

Example of changes to RR Article **59**:

ARTICLE 59

Entry into force and provisional application of the Radio Regulations (WRC-~~2000~~07)

59.1 These Regulations, which complement the provisions of the Constitution and Convention of the International Telecommunication Union, and as revised and contained in the Final Acts of WRC-95, WRC-97, WRC-2000~~ and~~, WRC-03 and WRC-07, shall be applied, pursuant to Article 54 of the Constitution, on the following basis. (WRC-0~~3~~7)

[…]

59.9 The other provisions of these Regulations, as revised by WRC-07, shall enter into force on [dd/mm/yy[1]], with the following exceptions:

59.10 – the revised provisions for which other effective dates of application are stipulated in Resolutions:

…

1 For example 1 January 2009.

Example of new Resolution:

ADD

NEW RESOLUTION XXX (WRC-07)

Provisional application of certain provisions of the Radio Regulations as revised by WRC-07

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that this Conference has adopted a partial revision to the Radio Regulations (RR) in accordance with its terms of reference which will enter into force on [dd/mm/yy[1]];

1 For example 1 January 2009.

b) that some of the provisions, as amended by this Conference, need to apply provisionally as of an earlier date;

c) that as a general rule, new and revised Resolutions and Recommendations enter into force at the time of signing of the Final Acts of a conference;

d) that as a general rule, Resolutions and Recommendations which a WRC has decided to suppress are abrogated at the time of the signing of the Final Acts of the conference,

resolves

1 that, as of [dd/mm/yy[2]], the following provisions of the RR, as revised or established by this Conference, shall provisionally apply: Nos. …, Table **21-4**, …;

2 that, when the Bureau, under No. **11.31**, conducts its examination of notifications of frequency assignments to satellite networks in the band 2 500-2 690 MHz in respect of compliance with the power flux-density (pfd) limits, it shall base its findings on the pfd limits which were in force prior to [dd/mm/yy[3]] for those satellite networks for which complete Appendix **4** coordination information has been received prior to that date.

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2 For example 16 November 2007.

3 For example 16 November 2007 or 1 January 2009.

3/1.9/5.5.2 Option 2

This option has been established on the understanding that the intent is to let the satellite systems (fixed-satellite service, broadcasting-satellite service or radiodetermination-satellite service), for which complete notification information has been received by the Radiocommunication Bureau by the end of the WRC-07 (i.e. before 17 November 2007) and for which the corresponding frequency assignments have been brought into use by dd/mm/yy[3], operate under the current limits of the RR.

This option ensures non-retroactive application of new pfd limits to the satellite networks which have already started their coordination process and also allows such networks to choose, as the date of bringing into use, any date in accordance with the applicable provisions of RR Article **11**.

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3 31 December 2008.

MOD

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

Section V – Limits of power flux-density from space stations

TABLE **21-4** (WRC-~~03~~07)

Frequency band	Service*	Limit in dB(W/m²) for angles of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
2 500-2 690 MHz 2 520-2 670 MHz 2 500-2 516.5 MHz (No. **5.404**) 2 500-2 520 MHz 2 520-2 535 MHz (No. **5.403**)	Fixed-satellite Broadcasting-satellite Radiodetermination-satellite Mobile-satellite Mobile-satellite (except aeronautical mobile-satellite)	~~−152~~[9] [*X*][21]	~~−152 + 0.75(δ – 5)~~[9] [*X*] + ([*Y*]–[*X*])/20*(δ – 5)[21]	~~−137~~[9] [*Y*][21]	~~4 kHz~~ 1 MHz

NOTE – This Table needs to be aligned with the values that are decided in terms of the methods.

……

[21] **21.16.19**

In the 2 500-2 690 MHz band, these limits do not apply to emissions of any space station of a system in the fixed-satellite service, broadcasting-satellite service or radiodetermination-satellite service for which complete notification information has been received by the Radiocommunication Bureau before dd/mm/yy[1], and whose frequency assignments in the 2 500-2 690 MHz band were brought into use by dd/mm/yy[2]. In that case, the following limits shall apply:

-152 dB(W/m^2) for $\delta \le 5°$

$-152 + 0.75(\delta - 5)$ dB(W/m^2) for $5° \le \delta \le 25°$

-137 dB(W/m^2) for $\delta \ge 25°$

in any 4 kHz band, where δ is the angle of arrival above the horizontal plane.

NOTE – This Table needs to be aligned with the values that are decided in terms of the methods.

1 17 November 2007.

2 31 December 2008.

MOD

ARTICLE 59

Entry into force and provisional application of the Radio Regulations (WRC-~~2000~~7)

59.1 These Regulations, which complement the provisions of the Constitution and Convention of the International Telecommunication Union, and as revised and contained in the Final Acts of WRC-95, WRC-97, WRC-2000~~ and~~, WRC-03 and WRC-07, shall be applied, pursuant to Article 54 of the Constitution, on the following basis. (WRC-0~~3~~7)

[…]

59.9 The other provisions of these Regulations, as revised by WRC-07, shall enter into force on [dd/mm/yy[1]], with the following exceptions:

59.10 – the revised provisions for which other effective dates of application are stipulated in Resolutions:

1 For example 1 January 2009.

Example of new Resolution:

ADD

NEW RESOLUTION XXX (WRC-07)

Provisional application of certain provisions of the Radio Regulations as revised by WRC-07

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that this Conference has adopted a partial revision to the Radio Regulations (RR) in accordance with its terms of reference which will enter into force on [dd/mm/yy[1]];

b) that some of the provisions, as amended by this Conference, need to apply provisionally as of an earlier date;

1 For example 1 January 2009.

c) that as a general rule, new and revised Resolutions and Recommendations enter into force at the time of signing of the Final Acts of a conference;

d) that as a general rule, Resolutions and Recommendations which a WRC has decided to suppress are abrogated at the time of the signing of the Final Acts of the conference,

resolves

1 that, as of dd/mm/yy[2], the following provisions of the RR, as revised or established by this Conference, shall provisionally apply: Nos. **5.403**, **5.414**, **5.415**, **5.419**, **5.420**, **21.16.19**, Table **21-4**, Table 5-2 of Appendix **5**.

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2 17 November 2007.

Agenda item 1.11

"to review sharing criteria and regulatory provisions for protection of terrestrial services, in particular terrestrial television broadcasting services, in the band 620-790 MHz from broadcasting-satellite service networks and systems, in accordance with Resolution 545 (WRC-03)"

Resolution 545 (WRC-03) – Technical and regulatory procedures relating to the broadcasting-satellite service networks operating in the 620-790 MHz band

Executive summary

WRC-07 Agenda item 1.11 was established at WRC-03 "to review sharing criteria and regulatory provisions for protection of terrestrial services, in particular terrestrial television broadcasting services, in the band 620-790 MHz from broadcasting-satellite service networks and systems, in accordance with Resolution **545 (WRC-03)**".

The terrestrial broadcasting service is allocated on a primary basis in all three Regions and several administrations have already undergone a transition to digital terrestrial television operation in this band, while in some other administrations and Regions the transition process is being developed.

On a worldwide basis terrestrial services, especially television broadcasting, make extensive use of the 620-790 MHz frequency range with a very large number of entries in the Master International Frequency Register (MIFR). There are only two satellites operating in accordance with RR No. **5.311** since the footnote was added in 1979.

While GE-06 (RRC-06) established a frequency *Plan* for digital broadcasting in Region 1, except Mongolia, and in the Islamic Republic of Iran, GE-06 Resolution 1 (RRC-06) - Broadcasting-satellite service in the band 620-790 MHz, *resolves to invite* WRC-07 to take appropriate and necessary measures to effectively protect the broadcasting Plans adopted by RRC-06 and their subsequent evolution from the GSO-BSS and/or non-GSO BSS networks/systems which were not brought into use prior to 5 July 2003. GE-06 Resolution 1 also *resolves* to take appropriate and necessary measures in order that the ground terminals of GSO and/or non-GSO BSS networks/systems which were not brought into use prior to 5 July 2003 shall not claim protection from the Plans adopted by this Conference and their subsequent evolution, nor put any constraint on the operation of the assignments of the Plans and their subsequent evolution.

Administrations have not taken account of any additional margins in their broadcasting allotment plans for the introduction of BSS in the band. These administrations acknowledge that other ITU Members not party to the GE-06 (RRC-06) have already extensively explored the use of the frequency band 620-790 MHz, together with the remaining part of the UHF Band V, for their analogue and digital terrestrial systems and some of these countries are exploring their terrestrial broadcasting for the future. These matters are taken into account in Report ITU-R BT.2075.

There are primary allocations to fixed and mobile services in this frequency range throughout many areas of the world, and there are many systems currently deployed. Many Administrations are looking to further expand and develop these types of terrestrial systems in the near future. These fixed and mobile systems as well as ARNS (RR No. **5.312**) also require full protection from any BSS operating in the same frequency band.

The following methods are proposed to satisfy this agenda item:

The first objective common to each method is to enable all existing satellite systems to continue to operate without any additional regulatory constraints, and to ensure that such systems can be replaced with ones using identical technical parameters and subject to the same regulatory procedures that existed prior to WRC-03. It is proposed that this be achieved via the suppression of Recommendation **705** and either the suppression or replacement of RR No. **5.311 (WRC-03)**.

In effect a new regulatory regime is proposed to protect existing and future terrestrial services in the band, and allow for the possibility for the shared use of the band with BSS in the case of two of the Methods.

– Method A1 proposes modifications to RR No. **5.311 (WRC-03)** and modifications to Resolution **545 (WRC-03)** to bring this Resolution up to date and to specify how BSS filings will be processed in the future and how to protect the assignments of satellite systems brought into use before 5 July 2003. This Method proposes hard limits that were developed with the intention to provide regulatory protection to existing and future terrestrial services.
– Method A2 proposes modifications to RR No. **5.311 (WRC-03)**, by requiring the explicit agreement for the BSS in order to ensure that existing and future terrestrial services are fully protected as well as modifications to Resolution **545 (WRC-03)** to bring this Resolution up to date and to specify how BSS filings will be processed in the future.
– Method B proposes suppression of RR No. **5.311 (WRC-03)** and development of a draft new Resolution **[620-790 MHz] (WRC-07)** to protect the assignments of those GSO BSS operating in frequency band 620-790 MHz notified and brought into use before 5 July 2003.

Resolution **545 (WRC-03)** *invites ITU-R*

"to conduct studies as a matter of urgency, and develop sharing criteria and regulatory provisions, prior to WRC-07, for the protection of terrestrial services, in particular terrestrial television broadcasting service, in the 620-790 MHz band from GSO BSS networks and non-GSO BSS satellite networks or systems which it is planned to operate in this band"

3/1.11/1 Background

The services currently allocated in the frequency band 620-790 MHz are television broadcasting service (BS) (refer RR Nos. **1.128** and **1.38** for definition of television broadcasting), fixed service (FS), mobile service (MS), aeronautical radionavigation service (ARNS) and the broadcasting satellite service (BSS) limited for the time being to two existing satellite systems.

There is a choice to be made between using this spectrum to provide continued maximum coverage for terrestrial services or to allow further BSS development. The inherent issue is that both services will become constrained by each other if both are to share the same spectrum. The BSS also inherently has an impact on many countries simultaneously from one satellite with no possibility of terrain screening to enable rapid geographical reuse of spectrum.

The planning of the terrestrial TV services relies on the spectrum being reusable often at minimum interstation separation distances. Terrestrial TV planning also relies on historically known low background noise levels to provide a service to outlying communities. The Regional Radiocommunications Conference in 2006 has also just developed the new Digital Broadcasting Plan, GE-06, covering about 120 countries and has sent a Resolution to WRC-07 covering the need to protect these Plans plus their future development. This new Plan has been developed to use all this particular spectrum to the maximum extent possible with no reserve margins for additional interfering services.

3/1.11/1.1 Television broadcasting

The BS is allocated on a primary basis in all three Regions and several administrations have already undergone a transition to digital television operation in this band, while in some other administrations and Regions; the transition process is being developed.

GE-06 (RRC-06) has established a frequency *Plan* for digital broadcasting. GE-06 Resolution 1 (RRC-06) – Broadcasting-satellite service in the band 620-790 MHz, resolves to invite WRC-07 to take appropriate and necessary measures to effectively protect the broadcasting Plans adopted by RRC-06 and their subsequent evolution from the GSO-BSS and/or non-GSO BSS networks/systems which were not brought into use prior to 5 July 2003. GE-06 Resolution 1 (RRC-06) also resolves to take appropriate and necessary measures in order that the ground terminals of GSO and/or non-GSO BSS networks/systems which were not brought into use prior to 5 July 2003 shall not claim protection from the Plans adopted by this Conference and their subsequent evolution, nor put any constraint on the operation of the assignments of the Plans and their subsequent evolution.

3/1.11/1.2 Fixed service

The definition of a *fixed service* is contained within RR No. **1.20**. The frequency range 620-790 MHz is allocated to the FS on a primary basis in Region 3. This frequency range is also allocated to the FS on a secondary basis in Region 2 and in some countries within Region 1 (see RR No. **5.300**). In some Region 2 administrations, the frequency band is allocated to the FS on a primary basis, subject to RR No. **9.21** agreement (see RR Nos. **5.293** and **5.309**). Provisions given in RR No. **5.311** are applicable to protect the fixed service in Regions 2 and 3.

3/1.11/1.3 Mobile service

The definition of a *mobile service* is contained within RR No. **1.24**. Eleven administrations in Region 2 have a primary mobile allocation that is subject to RR No. **9.21** agreement (see RR No. **5.293**). In the RR Table of Frequency Allocations, there is a primary allocation in Region 3 and a secondary allocation to the MS in Region 2. Twenty-five Region 1 administrations have a secondary land mobile service (LMS) allocation for applications ancillary to broadcasting, per RR No. **5.296 (WRC-03)**. RR No. **5.311** is applicable to protect the MS allocation in some countries in the 3 Regions

3/1.11/1.4 Aeronautical radionavigation service in the band 645-790 MHz

The definition of an *aeronautical radionavigation service* is contained within RR No. **1.46**. The RR Article **5** provisions applicable to the ARNS in 620-790 MHz consist of RR No. **5.312.** The 645-862 MHz band is allocated in a number of countries of Region 1 to the ARNS on a primary basis. Within this service several types of radionavigation systems are used in the 645-790 MHz band, including radio systems of short-range navigation (Russian Short-Range Air Navigation System), and secondary surveillance radars of the air traffic control (ATC) which includes the ground radar and the onboard transponder. All specified means are used to support navigation and air traffic control functions.

3/1.11/1.5 Broadcasting satellite service

The definition of the broadcasting satellite service is contained within RR No. **1.39**.

RR Nos. **23.13**, **23.13A**, **23.13B** and **23.13C** apply to the BSS.

3/1.11/1.6 Current status of regulatory procedures in the Radio Regulations

RR No. **5.311** defines the conditions of the currently registered systems in use in the band 620-790 MHz where assignments were made to television stations using frequency modulation in the broadcasting-satellite service (BSS). These conditions include power flux-density limits for angles of arrival less than 20°, which are based on the content of Recommendation **705**, which does not address specifically digital BSS transmissions nor digital BS transmissions. Similarly, BSS systems shall obtain the agreement of administrations concerned where television broadcast services operating or to be operated in the future are likely to be affected.

Recommendation **705** was developed to provide for a satellite system applying analogue FM modulation techniques. Based on RR No. **5.311** and Recommendation **705**, studies prior to WRC-03 identified ambiguity over the reference bandwidth of RR No**. 5.311** and Recommendation **705**. Agreement was not achieved on this subject during WRC-03, WRC-07 Agenda item 1.11 and Resolution **545 (WRC-03)** addresses this matter.

Resolution **545 (WRC-03)** also addresses Article RR No. **22.2** in *resolves* 6.

3/1.11/2 Summary of technical and operational studies and relevant ITU-R Recommendations

3/1.11/2.1 Relevant ITU-R Recommendations

The following ITU-R Recommendations are relevant for the BS for the frequency range 620-790 MHz: Recommendation ITU-R BT.417, Recommendation ITU-R BT.419, Recommendation ITU-R BT.798, Recommendation ITU-R BT.1123, Recommendation ITU-R BT.1125, Recommendation ITU-R BT.1206 and Recommendation ITU-R BT.1368.

ITU-R Recommendations which are relevant to the FS for the frequency range 620-790 MHz are: Recommendations ITU-R F.699, ITU-R F.1670, ITU-R F.758, ITU-R F.1107, ITU-R F.1108, ITU-R SF.1006, ITU-R SF.1602.

3/1.11/2.2 System characteristics including antenna patterns, space segment and ground facilities/reception of GSO BSS networks and non-GSO BSS satellite networks/systems

ITU-R studies have focused on the system characteristics of those proposed digital GSO BSS networks and non-GSO BSS satellite networks/systems rather than those of the existing GSO BSS networks using frequency modulation technique. Some information on the system characteristics of the new or planned GSO BSS networks and non-GSO BSS satellite networks/systems are found as an example in Report ITU-R BT.2075, Appendix 1. This includes proposed types of orbits, frequency bands for uplink and downlink, transmission signal parameters, antenna radiation patterns, space and earth station characteristics and link budgets. The BSS system characteristics described are equivalent to power flux-density levels of –138 dBW/m^2/MHz for low elevation angles ($\delta \leq 20° + x°$) and –122 dBW/m^2/MHz for high elevation angles ($\delta \geq 60° + x°$).

3/1.11/2.3 Operational features of proposed GSO BSS networks and non-GSO BSS satellite networks/systems

Some information can also be found in Report ITU-R BT.2075, Appendix 1. This includes a description of user terminals (receive only), gateway station interconnected with terrestrial networks for the transfer of information to the user terminal via the satellite segment, duration of satellite activity, the constellation of satellites GSO and non-GSO where two satellite configurations have been considered:

– a GSO system covering low latitude zones (equatorial regions);

– a constellation of three satellites in non GSO covering higher latitude zones (medium and high latitude regions).

3/1.11/2.4 System characteristics of terrestrial television broadcasting service, in the band 620-790 MHz

Pertinent characteristics and parameters for several types of TV broadcasting systems, including analogue and digital systems, are contained in Tables 1 to 7 of Report ITU-R BT.2075. These characteristics are drawn from the above mentioned ITU-R Recommendations, in particular Recommendation ITU-R BT.417, Recommendation ITU-R BT.419, and Recommendation ITU-R BT.1368.

Protection criteria for BS reception from BSS signals

With free-space propagation conditions for BSS signals, the protection criteria for the broadcasting service can be derived from the following formula:

For analogue BS:

$$E_{max\_int} = E_{min} - PR - IM + D_{dir} + D_{pol} = \varphi_{max\_int} + 145.8 \quad (1a)$$

For digital BS:

$$E_{max\_int} = E_{med} + q\sqrt{\left(\sigma_w^2 + \sigma_i^2\right)} - PR - IM + D_{dir} + D_{pol} = \varphi_{max\_int} + 145.8 \quad (1b)$$

where:

- E_{max_int} : maximum allowable BSS field strength at the wanted receiving antenna (dB(μV/m))
- E_{min} : minimum wanted analogue BS field strength at the wanted receiving antenna (dB(μV/m)) as per Recommendation ITU-R BT.417-5, $E_{min} = 62 + 20\log(f/474)$. ($f = 700$ MHz). E_{min} is 6 dB lower at 700 MHz for analogue fringe coverage areas
- E_{med} : median wanted digital BS field strength at the wanted (BS) receiving antenna (dB(μV/m)) as per Recommendation ITU-R BT.1368-6, and $E_{med} = E_{min} - q\sigma_w$
- σ_w : standard deviation of the normal distribution of the wanted signal (digital BS signals)
- σ_i : standard deviation of the normal distribution of the interfering signal (digital BSS signals). It should be noted that, in the calculations undertaken, σ_i was assumed to be 0 dB
- q : correction factor obtained from the complementary cumulative inversed normal function $Q(x\%)$, where $x\%$ represents the locations where a certain field strength is present (here, E_{min})
- $q\sigma_w$: location correction factor (Recommendation ITU-R P.1546)
- $q\sqrt{\left(\sigma_w^2 + \sigma_i^2\right)}$: propagation correction factor (Recommendation ITU-R P.1546)
- PR : appropriate BS protection ratio with an additional time correction factor (3 dB) for the analogue BS case only (dB)

IM : allowance for interservice sharing (dB). (10 dB in all cases except for Digital System A for which 9.1 dB is used)

D_{dir} : BS receiver antenna directivity discrimination with respect to BSS signal (dB). (Refer to Recommendation ITU-R BT.419-3)

D_{pol} : BS receiver polarization discrimination with respect to BSS signal (dB). D_{pol} = 1.25 dB (except for fixed reception high elevation angles cases where D_{pol} = 0 dB)

φ_{max_int} : maximum BSS power flux-density at receiving antenna dBW/m^2 within the nominal BS channel bandwidth (BS channel bandwidth in the band 620-790 MHz ranges from 6 to 8 MHz).

This method is in accordance with the method described in Recommendation ITU-R BT.1368-6.

In the application of this criteria, it was assumed that the gain of the fixed receiving television antenna is at its maximum value over all azimuth angles from the main pointing axis up to 20° and is 16 dB less than maximum at angles greater than 60°, with a linear interpolation at angles between 20° and 60°. This is consistent with Recommendation ITU-R BT.419-3 and simplifies the evaluation of maximum allowable interference.

The television receiving antenna as specified in Recommendation ITU-R BT.419-3 may be installed with its main pointing axis elevated relative to the local horizon in cases where reception is partially via a diffracted signal or where the service transmitter is located at an elevated site above the receiver. Table 1.11-1 incorporates a factor of x° in the elevation angular data to allow for these installations. The value to be used for x° will be 15° or some other value as specified in the footnote to Table 1.11-1.

For polarization discrimination, it was assumed, based on the study in Report ITU-R BT.2075 that it is a maximum of 1.25 dB for all elevation angles up to 20° + x°. According to Recommendation ITU-R BT.419-3, polarization discrimination is already taken into account for BSS transmissions arriving at angles above 60°+ x° and so no polarization discrimination factor is used for higher angles for fixed reception.

3/1.11/2.5 System characteristics of mobile service

In Region 2, MS are either already operating or are being planned for operation in parts of the 620-790 MHz band and in accordance with RR No. **5.293**, the band 614-806 MHz is allocated in a number of countries in Region 2 to the MS on a primary basis.

For the purpose of conducting sharing studies, DN Recommendation ITU-R M.[LMS.Char.VHF-UHF], [Doc. 8/168] and PDN Recommendation ITU-R M.[LMS Char.cell], [Doc. 8A/468, Annex 9] contain technical and operational characteristics of land mobile systems, some of them operating within the 620-790 MHz band in Region 2 and Region 3 only. The draft new Recommendation ITU-R M.[LMS.Char.VHF-UHF] addresses technical and operational characteristics of conventional and trunked land mobile systems operating in the MS allocations below 960 MHz to be used in sharing studies. It notes a series of other Recommendations in the M and SM series. It recommends that for interservice and intraservice frequency sharing studies in bands below 960 MHz, the representative technical and operational characteristics of conventional and trunked land mobile systems given in its Annex 1 should be used.

In addition, current studies that deal with the evaluation of the impact from BSS into land mobile systems in the band 620-790 MHz are expected to lead to an ITU-R Report on the evaluation of BSS compatibility with land mobile systems.

To study the potential impact of BSS interference on public safety systems in the bands 764-770 MHz and 794-800 MHz, a statistical analysis of aggregate interference from a GSO BSS and a non-GSO BSS*, with the following orbital locations was considered:

– GSO BSS at longitude 26º E and a non-GSO BSS* at longitude 0º, latitude 63.4º N and at a distance of 53 481 km.

The studies recognize that there are allocations to the MS in some regions in this band that also need to be addressed; in particular, footnote RR No. **5.293** which allocates the band to the fixed and mobile services on a primary basis in several Region 2 countries. In addition, Resolution **646 (WRC-03)** encourages administrations in Region 2 to consider the band 746-806 MHz for advanced public protection and disaster relief solutions. Spectrum in the bands 764-776 MHz and 794-806 MHz is used in some Region 2 administrations for public safety applications.

Studies have been conducted for the protection of the LMS from BSS interference assuming reference bandwidths of 8 MHz and 24 MHz.

3/1.11/2.6 System characteristics of fixed service

System characteristics of the FS are found in Recommendation ITU-R F.758-4. This Recommendation contains principles for the development of sharing criteria of digital systems in the FS. It also contains information on the technical characteristics and sharing parameters of digital systems in the FS. Information relating to analogue systems is contained in prior versions of this Recommendation.

3/1.11/2.7 System characteristics of aeronautical radionavigation service

System characteristics of the ARNS are found in the preliminary draft new Recommendation ITU-R M.[Doc. 8B/441, Annex 10] on “Technical characteristics and protection criteria of aeronautical radionavigation service systems in 645-862 MHz frequency band”. This preliminary draft new Recommendation includes the basic characteristics and protection criteria for different types of aeronautical radionavigation stations operating in the band 645-862 MHz including several types of radionavigation systems used:

– radio systems of short-range navigation (RSBN);
– secondary radars of the air traffic control (ATC) which includes the ground radar and the onboard transponder;
– primary airfield /and route radars of the ATC.

* The studies considered an HEO system.

3/1.11/3 Analysis of the results of studies

3/1.11/3.1 Protection of the terrestrial television broadcasting service

Within the band 620-790 MHz the terrestrial broadcasting services requiring protection are both analogue and digital television broadcasting.

Summary of calculated maximum interfering power flux-density

Calculations of the maximum interfering power flux-density have been performed for a range of cases for analogue and digital terrestrial television broadcasting systems. The key results of the studies as summarised in Table 8 of Report ITU-R BT.2075 converted to a reference bandwidth of 1 MHz and rounded to the nearest whole number. Here Table 8 in the draft new Report is presented as Table 1.11-1 (refer to the Tables mentioned in column 2 for power flux-density values in the nominal system bandwidth for each system).

TABLE 1.11-1

Summary of calculated maximum interfering single entry power flux-density

BS system to be protected from BSS	Reference in Report ITU-R BT.2075	Maximum interfering pfd ($dBW/m^2/MHz$) $\delta \leq 20° + x°$ RR Note 1	Maximum interfering pfd ($dBW/m^2/MHz$) $\delta \geq 60° + x°$ RR Note 1
Analog television service – nominal coverage area (fixed reception)	Table 1	–142	–127
Analog television service – fringe coverage area (fixed reception)	Table 1	–148	–133
Digital System A (ATSC) (fixed reception)	Table 2	–142	–127
Digital System B (DVB-T) (fixed reception)	Table 3	–137	–122
Digital System C (ISDB-T) (fixed reception)	Table 4	–138	–123
Digital Systems B and C (DVB-T & ISDB-T) (portable outdoor reception)	Table 5	–130	–130
Digital Systems B and C (DVB-T & ISDB-T) (portable indoor reception)	Table 6	–122	–122
Digital Systems B and C (DVB-T & ISDB-T) (mobile reception)	Table 7	–130	–130

NOTE 1 – The factor $x°$ is indicated here as a reminder that the receiving antenna discrimination is obtained using directly Recommendation ITU-R BT.419-3, hence assuming a typical tilt angle of 0° for these antennas. Investigations have shown that this assumption does not remain valid in hilly environments. Report ITU-R BT.2075 concludes that a representative average tilt angle $x° = 10°$ can be used although some Administrations stated that a representative tilt angle of $x = 15°$ or some other value may be more appropriate to cover this phenomenon. In the case of Digital System A (ATSC) no tilt angle is specified ($x = 0°$).

Conclusion on protection criteria for BS reception from BSS signals

Some administrations believe that the analysis undertaken by the ITU-R and summarised in Table 8 of Report ITU-R BT.2075 can form a basis for specifying appropriate allowable power flux-density levels from systems in the BSS proposed for operation in the 620-790 MHz band.

Based on the information in Appendix 1 to the draft new Report, the proposed digital BSS system characteristics are equivalent to power flux-density levels of –138 dBW/m^2/MHz for low elevation angles ($\delta \leq 20° + x°$) and –122 dBW/m^2/MHz for high elevation angles ($\delta \geq 60° + x°$).

The summary in Table 1.11-1 shows that analogue television systems and Digital System A require greater protection (i.e. lower pfd limits) from both low and high elevation angles of arrival.

The protection requirements for fixed reception of Digital Systems B and C are approximately equivalent to the proposed BSS power flux-density levels, however, greater protection (i.e. lower pfd limits) is required by Digital Systems B and C in the portable outdoor and mobile reception cases for high elevation angles.

3/1.11/3.2 Protection of the mobile service in the band 620-790 MHz

The results of studies to date indicate that, on the basis of an *I*/*N* criterion of –6 dB for the protection of LMS, BSS systems operating with the pfd levels of Recommendation **705** in a 8 MHz reference bandwidth can exceed the *I*/*N* criterion, the excess being in the worst case 4.6 dB. With the same pfd levels in a reference bandwidth of 24 MHz, the resulting *I*/*N* does not exceed the *I*/*N* criterion of –6 dB.

Specifically regarding the reference bandwidth, if an 8 MHz bandwidth is assumed, there may be some impact on public safety systems with the given pfd limits. If a 24 MHz reference bandwidth is assumed, there does not seem to be any impact on public safety systems with the given pfd limits, assuming that the carrier power is spread evenly across this 24 MHz bandwidth.

Some systems, including public safety systems in the LMS, may require an *I*/*N* criterion up to –10 dB. In this case, the impact of BSS systems with pfd levels from Recommendation **705** will exceed, in the worst case, the required *I*/*N* by 8.6 dB or 3.5 dB if we assume a reference bandwidth of 8 MHz or 24 MHz respectively.

Given the ubiquitous nature of the MS, administrations in Region 2 with such land mobile systems according to RR No. **5.293** believe that BSS should not be protected from these systems and any constraints placed on the terrestrial services would not be acceptable.

3/1.11/3.3 Protection of the fixed service in the band 620-790 MHz

ITU-R has taken into account that with regard to the protection criterion to be used in the compatibility analyses, Recommendation ITU-R F.1107 indicated that:

"For bands where the fading is controlled by multipath, Recommendation ITU-R F.758 states that, in principle, the interference level relative to receiver thermal noise should not exceed −10 dB (or −6 dB). In the case of digital FS systems, these values correspond to an FDP_{hop} of 10% (or 25%), respectively. It is recommended that, if possible, the −10 dB value be adopted."

ITU-R considers for the protection of the FS, the value of –10 dB for this frequency range should be adopted.

3/1.11/3.4 Protection of the aeronautical radionavigation service in the 645-790 MHz band

RR No. **5.312** applies to the ARNS in the 645-790 MHz band where in a number of administrations the band 645-862 MHz is also allocated to the ARNS on a primary basis.

Studies have been conducted within ITU-R to determine maximum interfering power flux-densities to protect ARNS in the 645-790 MHz. The ITU-R studies showed that the maximum allowable value for power-flux density of a digital BSS space station needed to protect ARNS is:

$\varphi = -137$ dBW/m^2/MHz $= -161$ dBW/m^2/4 kHz	for angles of arrival below 60°
$\varphi = -136$ dBW/m^2/MHz $= -160$ dBW/m^2/4 kHz	for angles of arrival between 60° and 90° for circularly polarised BSS signals
$\varphi = -137$ dBW/m^2/MHz $= -161$ dBW/m^2/4 kHz	for angles of arrival between 60° and 90° for BSS signals with other polarisation.

However, it has been noted that existing analogue BSS networks are operating with the pfd levels of –121 dBW/m^2/MHz over some countries listed in RR No. **5.312**. The sharing is based on frequency separation ensuring there are some analogue systems operating with pfds less stringent than the above values in accordance with agreements with affected administrations.

3/1.11/3.5 Impact of BSS satellite networks/systems individually and collectively on the terrestrial services in particular television broadcasting

Studies were undertaken in ITU-R regarding impact of BSS satellite networks/systems individually and collectively on the terrestrial services in particular television broadcasting. The results of these studies can be found in Report ITU-R BT.2075 Appendix 1 which states:

"Interference into terrestrial receiving stations from transmitting BSS satellites can be assessed either by consideration of single entry or aggregate interference. The aggregate level of interference will always exceed the single entry level. The analysis demonstrates that the difference between the aggregate value and the single entry value is small, when considering interference into terrestrial BS receivers located inside the BSS service area"

3/1.11/3.6 Study on maximum number of satellites in a BSS network/system which may be deployed in this frequency band

ITU-R studies have illustrated that a single-entry power flux density limit needs to be approximately 1 dB lower than it otherwise would be in order to cater for the possibility of an aggregate power flux density resulting from several satellites. Refer Report ITU-R BT.2075 Appendix 1 which states:

"the maximum number of BSS systems has been established by use of the RR Appendix **5** criterion for establishing the need for coordination between GSO satellite networks. This is that the increase in noise temperature in the wanted BSS reception downlink caused by an interfering network should not exceed 6% when expressed as a ratio $\Delta T/T$ where T is the receiving system noise temperature in the wanted link.

The six systems can operate together with acceptable levels of inter-system interference. Any attempt to introduce additional BSS systems with usable service areas would lead to the need to coordinate between systems which would be extremely difficult, due to the lack of directionality in the BSS receiving terminals."

3/1.11/3.7 Relationship between space services

ITU-R has identified RR Nos. **9.11** and **22.2** are to be considered in relation to other space services and the relationship between space services in the band 620-790 MHz.

3/1.11/4 Methods to satisfy the agenda item

3/1.11/4.1 General considerations

The outcome of agreement on these Methods to satisfy the agenda item will determine whether the suspension in provision RR No. **5.311** is removed or the footnote is retained or suppressed at WRC-07 and modifications to Resolution **545 (WRC-03)** and or the proposed Resolution **[620-790 MHz] (WRC-07)**. The studies are to be considered essentially completed, particularly those matters outlined in Report ITU-R BT.2075. However the following also needs to be taken into account:

a) the clear and firm protection requirements of the GE-06 Plan and its future evolution established at RRC-06 for 120 countries of the Union as highlighted in Resolution 1 (RRC-06);

b) that other ITU Members not party to the GE-06 (RRC-06) have already extensively explored the use of the frequency band 620-790 MHz, together with the remaining part of the UHF Band V, for their analogue and digital terrestrial systems;

c) that these countries would further explore their terrestrial broadcasting in the future;

d) that the current regulatory text stipulates that the GSO and non-GSO BSS satellite networks/systems in 620-790 MHz shall not cause any harmful interference to nor claim protection from the terrestrial television broadcasting system in that band;

e) that Resolution 1 (RRC-06) has confirmed that requirement;

f) that if the condition of operation under "no harmful interference" and "no protection "is not accompanied by necessary operational evidence and fully guaranteed, the established Plan(s) and its future evolution as well as the use of the band outside the RRC-06 Planning Area could be seriously hampered;

g) that since the original provision of RR No. **5.311** was adopted some 25 years ago, until very recently, only two assignments relating to "STATSIONAR T" and "STATSIONAR T2" were notified to the Bureau, recorded in the MIFR and brought into use;

h) that the assignments referred to in g) above have not caused any harmful interference to nor claimed any protection from the terrestrial systems, including terrestrial television systems of any country; and

i) RR No. **23.13** shall apply to Methods A and B.

3/1.11/4.2 Method A

Method A is split into two options whereby Method A1 stipulates a hard limit mask deemed by some administrations as sufficient to protect the terrestrial services and Method A2 requires a seeking of agreement procedure on the satellite filing administration as an alternative way to ensure the protection of the terrestrial services.

In this Method the regulatory procedures that enable the continued operation of satellite systems brought into use before WRC-03 or their replacement with satellites with identical technical transmission parameters is guaranteed via the revision of the appropriate sections of Resolution **545 (WRC-03).**

An example of modifications proposed to RR No. **5.311 (WRC-03)** and also modifications to Resolution **545 (WRC-03)** for both Method A1 and A2 are provided in § 3/1.11/5. The proposed added footnotes contains provisions for primary terrestrial services in the band 620-790 MHz. Recognizing that under both Methods A1 and A2, RR No. **23.13** is applicable irrespective of the need to comply with certain technical conditions mentioned in these methods.

3/1.11/4.2.1 Method A1

Method A1 proposes modifications to RR No. **5.311** and modifications to Resolution **545 (WRC-03)** to bring Resolution **545 (WRC-03)** up to date and to specify how BSS filings will be processed in the future. Method A1 also provides appropriate pfd values for BSS future systems to protect the terrestrial television broadcasting service as described in Report ITU-R BT.2075 and other primary terrestrial services including the digital terrestrial broadcasting Plan established by RRC-06 and its evolution.

An example of modifications proposed to RR No. **5.311** addition of RR No. **5.311***bis* and also modifications to Resolution **545 (WRC-03)** are provided in § 3/1.11/5. The proposed added footnote contains provisions for primary terrestrial services in the band 620-790 MHz.

Advantages:

– Method A1 could provide some feasibility for sharing between BSS and BS and seeks to provide protection of the current and future usage of the terrestrial broadcasting, mobile, fixed and ARNS services in the 620-790 MHz band.
– This method offers continued operation of GSO satellite networks "STATSIONAR T" and "STATSIONAR T2" under the prevailing circumstances which would not create any difficulty for any administration and offers some scope for the future development of BSS in the band 620-790 MHz.
– This method seeks to provide pfd limits for the regulatory protection of terrestrial primary services including terrestrial broadcasting.
– Removes the ambiguities of the current RR including future ambiguities arising from RR No. **5.311**.

Disadvantages:

– The proposed pfd limits of Method A1 exceed those specified in Report ITU-R BT.2075 as necessary for the protection of analogue fringe coverage.
– Since the pfd values in Method A1 do not include a margin for aggregate interference such effect may require further consideration.
– There is no obligation by the administration which operates the BSS system to reduce the interference to acceptable levels.
– There is no explicit commitment to avoid unacceptable interference to primary terrestrial services at the operational stage of the satellite network or system.

3/1.11/4.2.2 Method A2

Method A2 proposes a possible regulatory procedure of modifications to RR No. **5.311 (WRC-03)** where explicit agreement is sought of the administrations whose territories are visible from the orbital position of the GSO BSS network or the operating orbital arc of the non-GSO BSS systems and modifications to Resolution **545 (WRC-03)**.

Advantages:

− Method A2 could provide some feasibility for sharing between BSS and BS and provides regulatory protection of the current and future usage of the terrestrial broadcasting, mobile, fixed and ARNS services in the 620-790 MHz band.

− This method offers continued operation of GSO satellite networks "STATSIONAR T" and "STATSIONAR T2" under the prevailing circumstances which would not create any difficulty for any administration and offers some scope for the future development of BSS in the band 620-790 MHz.

− Those assignments will not cause unacceptable interference to television stations worldwide in particular those established by the RRC-06 and their evolutions.

− Removes the ambiguities of the current RR. It also ensures no future ambiguities arising from RR No. **5.311 (WRC-03)**.

Disadvantages:

− In the case of Method A2 it may be complicated to obtain the necessary agreements to enable the satellite to be brought into use.

3/1.11/4.3 Method B

Method B proposes suppression of RR No. **5.311** and development of a draft new Resolution **[620-790 MHz] (WRC-07)**.

RR No. **5.311** was adopted by a WARC several decades ago which was slightly updated by WRC-03. However RR No. **5.311** defines the conditions of the currently registered systems in use in the band 620-790 MHz where assignments were made to television stations using frequency modulation in the broadcasting-satellite service. These conditions include power flux-density limits for angles of arrival less than 20°, which are based on the content of Recommendation **705**, which does not address specifically digital BSS transmissions nor digital BS transmissions.

Method B takes into account the band 620-790 MHz is heavily used in Regions 1, 2 and 3 for analogue terrestrial broadcasting service in many countries and digital BS has been already developed in a number of countries in this frequency range where the simulcast transmission period is foreseen to continue for many years to come and requires careful planning to minimize disruption of services.

Method B also takes into account two GSO satellite networks, "STATSIONAR T" and "STATSIONAR T2", have been operating for several decades without any reported harmful interference to or claiming any protection from the terrestrial systems, including terrestrial television systems of any country.

Examples of regulatory text for Method B is given in § 3/1.11/5.

Advantages:

- It ensures the necessary protection to the terrestrial services including digital terrestrial broadcasting. In particular, it protects from BSS the analogue and digital plan as established by GE-06 (RRC-06) and terrestrial services already operating or planned to be operated in the rest of the world, outside the RRC-06 Planning Area, and their evolution.
- Suppresses the burden of coordination from administrations and eliminates the workload of the Radiocommunication Bureau compared with the case if the suspended BSS GSO and BSS non-GSO were continued to be taken into account.
- Protects terrestrial services other than broadcasting operating or to be operated in the subject frequency band.
- Provides continued operation of GSO satellite networks “STATSIONAR T” and “STATSIONAR T2” under the prevailing circumstances which would not create any difficulty for any administration.
- Removes the ambiguities of the current Radio Regulations. It also ensures no future ambiguities arising from RR No. **5.311 (WRC-03)**.

Disadvantages:

- This method does not allow future implementation of BSS systems in the band 620-790 MHz except those operating before 5 July 2003. Refer to draft Resolution **[620-790 MHz] (WRC-07)**.

3/1.11/5 Regulatory and procedural considerations

3/1.11/5.1 Method A

Method A consists of two options – Method A1 and Method A2.

3/1.11/5.1.1 Method A1

A possible regulatory procedure to satisfy the agenda item could consist of the following applications of modifications to RR No. **5.311 (WRC-03)** and addition of RR No. **5.311***bis* and modifications to Resolution **545 (WRC-03)**:

MOD

5.311 Within the frequency band 620-790 MHz, assignments may be made to television stations using frequency modulation in the broadcasting-satellite service brought into use after end of WRC-07. The GSO BSS and/or non-GSO BSS terminals of the above-mentioned assignments shall not claim protection from television stations including the Plan(s) established by RRC-06 as evolved, nor shall they put any constraint on the operation of the assignments/allotments of the Plan(s) and its/their subsequent development as well as on the television stations operating or to be operated outside the planning area operating in the broadcasting service. Resolution **545 (Rev.WRC-07/Method A1)** applies (WRC-~~03~~07) RR No. **23.13** shall apply.~~subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected (see Resolutions **33 (Rev.WRC-03)** and **507 (Rev.WRC-03)**). Such stations shall not produce a~~ The power flux-density at the surface of the Earth produced by emissions from those assignments shall not exceed~~in excess of the value~~:

-142 dB(W/(m$^2 \cdot$ MHz))	for	$\delta \leq 20° + x°$
$-142 + 0.4\,(\delta - 20)$ dB(W/(m$^2 \cdot$ MHz))	for	$20° + x < \delta \leq 60° + x$
-130 dB(W/(m$^2 \cdot$ MHz))	for	$60° + x < \delta \leq 90°$

~~–129 dB(W/m^2) for angles of arrival less than 20°(see Recommendation **705**)~~ within the territories of other countries without consent of the administrations of those countries, where δ is the angle of arrival above the horizontal plane (degrees) of the radio frequency wave. ~~Resolution **545 (WRC-03)** applies.~~

Where x is a representative tilt angle of the television broadcasting receive antenna.

[*Editor's note: The CPM could not agree on the value of x but the results of studies as noted below Table 1.11-1 indicates Administrations stated that a representative tilt angle of x = 15° or some other value may be more appropriate to cover this phenomenon.]*

ADD

5.311*bis* The use of the band mentioned in No. **5.311 (WRC-07),** GSO BSS and/or non-GSO BSS shall not cause unacceptable interference to primary terrestrial services other than broadcasting in that band. The GSO BSS and/or non-GSO BSS terminals of the above-mentioned assignments shall not claim protection from primary terrestrial services nor they will put any constraint on the operation of the assignments. Within the territories of countries listed in No. **5.312** the power flux-density at the surface of the Earth produced by emissions from assignments under No. **5.311 (MOD WRC-07)** shall not exceed:

$$-137 \text{ dB(W/m}^2\text{/MHz)} \qquad \text{for} \qquad 0° \leq \delta \leq 90°$$

without the consent of the administration of those countries, where δ is the angle of arrival above the horizontal plane (degrees) of the radio-frequency wave. No. **23.13** shall apply. Resolution **545 (Rev.WRC-07)** applies.

MOD

RESOLUTION 545 (Rev.WRC-0~~3~~7/METHOD A1)

Technical and regulatory procedures relating to the broadcasting-satellite service networks ~~operating~~ in the 620-790 MHz band

The World Radiocommunication Conference (Geneva, 2007~~3~~),

considering

a) that No. **5.311** provides the conditions under which the band 620-790 MHz may be used for assignments to television stations using frequency modulation in the broadcasting-satellite service (BSS);

b) that it is necessary to protect terrestrial services such as the terrestrial television broadcasting services, fixed, mobile and the aeronautical radionavigation services in the 620-790 MHz band (see also Nos. **5.293**, **5.300**, **5.309** and **5.312**)~~that it is necessary to adequately protect terrestrial services including the terrestrial television broadcasting systems in this band~~;

~~*c)* that the sharing and associated provisions for satellite networks are under study in ITU-R with respect to the impact of such systems on the terrestrial services;~~

c~~d~~) that geostationary-satellite (GSO) BSS networks and non-geostationary (non-GSO) BSS satellite networks or systems are at the stage of advance publication and/or coordination as the case may be, or have been notified in the 620-790 MHz frequency band;

d~~e~~) that ~~studies are being undertaken to determine, *inter alia*, the planning criteria to be used for~~ the GE-06~~Regional Radiocommunication Conference (RRC-04/05)~~ established a terrestrial digital television broadcasting Plan for Region 1, excluding Mongolia, and one country in Region 3;

~~*f)* that the impact of these GSO BSS networks and non-GSO BSS satellite networks or systems on terrestrial services including digital and analogue television broadcasting systems has yet to be examined;~~

e~~g~~) that there are ~~at present few~~two GSO BSS networks ~~operating~~brought into use before 5 July 2003 in the band 620-790 MHz~~accordance with No. **5.311**~~;

~~*h)* that it would be inappropriate to draw any conclusions regarding the form and levels of the protection criteria and their application to GSO BSS networks and non-GSO BSS satellite networks or systems until the completion of relevant studies and the approval of corresponding ITU-R Recommendations;~~

f~~i~~) that many administrations have extensive infrastructure for the transmission and reception of analogue and digital television services between 620-790 MHz and to other terrestrial services other than broadcasting;

g) that some administrations are using or plan to use portions of the 620-790 MHz band for fixed, mobile service and ARNS applications,

noting

~~*a)* that the protection of terrestrial television services in the band 620-790 MHz requires more study before any conclusion can be made about the appropriate pfd values;~~

~~*b)* that studies called for in Recommendation **705** have been recently initiated but not completed;~~

~~*c)* that the reference bandwidth of the pfd limit in No. **5.311** is undefined and guidance is urgently needed and has been requested by the Radiocommunication Bureau;~~

~~*d)* that the existing provisions related to the band 620-790 MHz are ambiguous and have been difficult to apply by administrations and the Bureau;~~

a) that WRC-03 suspended processing of submissions of BSS networks or systems in the 620-790 MHz, irrespective of their date of receipt, pending WRC-07 decisions;

b) that WRC-03 specified that GSO BSS networks and non-GSO satellite networks or systems in the frequency band 620-790 MHz other than those notified, brought into use and the date of bringing into use confirmed before the end of WRC-03, shall not be brought into use before the end of WRC-07;

c) that transitional measures are needed to address the WRC-03 decisions in *notings a)* and *b)*,

resolves

1 that the Bureau resume the processing of submissions of GSO BSS networks and non-GSO BSS satellite networks or systems in the frequency band 620-790 MHz received by the Bureau and not brought into use prior to 5 July 2003, irrespective of their date of receipt~~, shall be suspended pending WRC-07 decisions on the sharing criteria, including the pfd required to protect the terrestrial services in this frequency band~~;

2 that the Bureau apply the Nos. MOD **5.311** (WRC-07) and ADD **5.311***bis* (WRC-07) to the GSO BSS networks and non-GSO BSS satellite networks or systems in the frequency band 620-790 MHz and for which coordination and/or notification have been received, as the case may be;

3 that GSO BSS networks in the frequency band 620-790 MHz that notified, brought into use and the date of bringing into use confirmed prior 5 July 2003 shall be allowed to continue to operate in accordance with the parameters recorded in the Master Register with favourable finding;

~~2 to suspend the application of No. **5.311 and Recommendation 705 until the end of WRC-07 with respect** to the GSO BSS networks and non-GSO BSS satellite networks or systems in the frequency band 620-790 MHz and for which notification is received between 5 July 2003 and the end of WRC-07;~~

~~3 that GSO BSS networks and non-GSO BSS satellite networks or systems in the frequency band 620-790 MHz other than those notified, brought into use and the date of bringing into use confirmed before the end of WRC-03, shall not be brought into use before the end of WRC-07;~~

4 that the notified date of bringing into use referred in Nos. **11.44** and **11.48** for GSO BSS networks and non-GSO BSS satellite networks or systems in this frequency band for which the Bureau ~~receives~~ received notification prior to 5 July 2003 but not brought into the use before that date shall be extended by the length of the period from the date of receipt by the Bureau of the complete advanced publication information to the end of WRC-07;

~~5 that the BSS systems referred to in *resolves* 1 above shall not be taken into account in the application of *resolves* 3.1C and 3.4 of Council Resolution 1185;~~

~~6~~5 that in the band 620-790 MHz, No. **22.2** shall ~~continue to~~ apply to assignments to non-GSO satellite systems in the BSS, including those for which complete coordination and/or notification information ~~is~~ are considered to have been received by the Bureau prior to 5 July 2003 ~~in respect of assignments to GSO satellite networks in the BSS for which complete coordination information is considered to have been received by the Bureau prior to 5 July 2003. The relationship between GSO networks and non-GSO satellite networks or systems for which complete Appendix **4** information has been received by the Bureau after 4 July 2003 in the band 620-790 MHz is subject to the procedures to be decided at WRC-07~~,

instructs the Director of the Radiocommunication Bureau

to implement this Resolution when applying Nos. MOD **5.311** (WRC-07) and ADD **5.311***bis* (WRC-07), Nos. **9.34** and **11.30** and other relevant associated provisions of the Radio Regulations.

3/1.11/5.1.2 Method A2

A possible regulatory procedure to satisfy the agenda item could consist of the following modifications to RR No. **5.311 (WRC-03)** and modifications to Resolution **545 (WRC-03)**:

MOD

5.311 Within the frequency band 620-790 MHz, assignments may be made to television stations in the broadcasting satellite service GSO and/or non-GSO brought into use after end of WRC-07 with the explicit agreement of the Administrations whose territories are visible from the orbital position of the GSO BSS network or the operating orbital arc of the non-GSO BSS systems. Those assignments shall not cause unacceptable interference to the terrestrial television broadcasting service (BS) and other primary terrestrial services and should not constrain their future evolution worldwide. The GSO BSS and/or non-GSO BSS terminals of the above-mentioned assignments shall not claim protection from the terrestrial television broadcasting service, other primary services and their future evolution. ~~using frequency modulation in the broadcasting-satellite service subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected (see Resolutions **33 (Rev.WRC-03)** and **507 (Rev.WRC-03)**). Such stations shall not produce a power flux-density in excess of the value −129 dB(W/m^2) for angles of arrival less than 20°(see Recommendation **705**) within the territories of other countries without consent of the administrations of those countries.~~ Resolution **545 (Rev.WRC-07)/Method A2)** (WRC-~~03~~07) applies. No. **23.13** shall apply.

Administration(s) responsible for the GSO and/or non-GSO satellite network(s)/system(s) shall at the time of their notification of the corresponding assignment(s) to the Bureau under Article **11** submit a formal written commitment signed by the authorized person in the administration department dealing with the matters clearly indicating that the above-mentioned conditions are fully observed at the operational stage. To this effect an appropriate column should be created in Appendix **4** and should be filled in by the notifying administrations when submitting coordination/notification information as appropriate to the Bureau. The above-mentioned commitment should also clearly state that if actual interference occurs to the terrestrial stations of other administrations by GSO and/or non-GSO, the responsible administration for these GSO and/or non-GSO shall immediately upon receipt of advice from the administration whose assignment(s) suffer interference, eliminate the unacceptable interference.

MOD

RESOLUTION 545 (Rev.WRC-0~~3~~7/METHOD A2)

Technical and regulatory procedures relating to the broadcasting-satellite service networks in the 620-790 MHz band

[*Editor's note:* SAME AS FOR METHOD A1 with the exclusion of reference to ADD **5.311***bis* in *resolves* 2 and *instructs the Director of the Radiocommunication Bureau*]

3/1.11/5.2 Method B

A possible regulatory procedure to satisfy the agenda item could consist of suppression of RR No. **5.311 (WRC-03)** and Recommendation **705** and a draft new Resolution **[620-790 MHz] (WRC-07)** be adopted by WRC-07 to recognize the rights and obligations of the use of the frequency band 620-790 MHz by satellite networks notified, and brought into use and the date of bringing into use confirmed before the end of WRC-03.

SUP

5.311 and **Recommendation 705**

ADD

RESOLUTION [620-790 MHz] (WRC-07)

Use of frequency band 620-790 MHz for existing assignments to broadcasting-satellite service

The World Radiocommunication Conference 2007 (WRC-07),

considering

a) that the Regional Radiocommunication Conference, Geneva 2006 (RRC-06) has adopted an Agreement and associated Plans for digital terrestrial broadcasting for Region 1, except Mongolia, and the Islamic Republic of Iran in the frequency bands 174-230 MHz and 470-862 MHz;

b) that the above-mentioned Conference, in its Resolution 1 (RRC-06) invited WRC-07, when considering Agenda item 1.11, to ensure that the Plan(s) established shall be effectively protected, *inter alia*, from the BSS GSO and non-GSO broadcasting-satellite networks/systems operating or planned to operate in the frequency band 620-790 MHz;

c) that many administrations have extensive infrastructure for the transmission and reception of analogue and digital television signals between 620 MHz and 790 MHz;

d) that it is necessary to protect terrestrial services such as the terrestrial television broadcasting services, fixed, mobile and the aeronautical radionavigation services in the 620-790 MHz band (see also Nos. **5.293**, **5.300**, **5.309** and **5.312**),

recognizing

a) that in accordance with provisions in No. **5.311**, developed at a previous Conference (1979), two assignments to "STATSIONAR T" and "STATSIONAR T2" BSS networks in the band 620-790 MHz were notified;

b) that Resolution **545 (WRC-03)** established that no new satellite networks or systems would be brought into use and the their date of bringing into use confirmed before the end of the World Radiocommunication Conference (Geneva, 2003) (WRC-03);

c) that, according to the records of the Bureau, there has been no complaint of any harmful interference to or request for claiming protection for these two assignments from the terrestrial television systems of any administration;

d) that GE06 Resolution 1 (RRC-06) – Broadcasting-satellite service in the band 620-790 MHz resolves to invite WRC-07 to take appropriate and necessary measures to effectively protect the broadcasting Plans adopted by RRC-06 and their subsequent evolution from the GSO-BSS and/or non-GSO BSS networks/systems which were not brought into use prior to 5 July 2003,

further recognizing

a) that there is a need to authorize these two assignments to continue their operation in providing the broadcasting-satellite service to their intended service area;

b) that this Conference has suppressed the provision No. **5.311 (WRC-03)**, in the light of the protection requirements of the terrestrial television systems mentioned in *considering* above,

resolves

1 that GSO BSS networks in the frequency band 620-790 MHz notified, recorded in the MIFR and brought into use prior to 5 July 2003 shall be allowed to continue to operate in accordance with the parameters recorded in the MIFR with favourable finding,

instructs the Director of the Radiocommunication Bureau

to implement this Resolution.

Agenda item 1.17

"to consider the results of ITU-R studies on compatibility between the fixed satellite service and other services around 1.4 GHz, in accordance with Resolution 745 (WRC-03)"

Resolution 745 (WRC-03) – Protection of existing services in all Regions from non-geostationary-satellite networks in the fixed-satellite service using the frequency bands around 1.4 GHz on a secondary basis

Executive summary

The fixed-satellite service intends to use the bands 1 390-1 392 MHz and 1 430-1 432 MHz for feeder links to non-geostationary MSS satellites, with requirements for global deployment of the corresponding earth stations. Frequency bands around 1.4 GHz are heavily used by a number of different services, for which a series of studies has been conducted. The results of these studies reveal that sharing will not be feasible with some services but could be achieved with other services at the expense of very stringent operating conditions for the FSS systems.

Regarding services operating around the band 1 390-1 392 MHz, sharing with aeronautical radiolocation systems will not be feasible, as required protection levels for the radiolocation service, would be exceeded by several orders of magnitude. Sharing with ground-based radiolocation systems will require large separation distances and will generally be very difficult in view of their widespread deployment. Sharing will not be feasible with transportable or mobile (in particular ship-borne) radiolocation systems.

Compatibility with passive services operating in the band 1 400-1 427 MHz can hypothetically be achieved at the expense of unusually stringent out-of-band emission reductions. No measurements of emissions from equipment that would be employed in operational systems have been provided.

Regarding services operating around the band 1 430-1 432 MHz, sharing is feasible with some services if power flux densities on FSS links are reduced to sufficiently low levels. Sharing with the aeronautical mobile service will not be feasible as the required protection levels cannot be met with the envisaged operational power flux density levels by almost 2 orders of magnitude.

One method to satisfy this agenda item has been addressed as in § 3/1.17/5 which is to suppress the secondary FSS allocation for MSS feeder links in the frequency bands 1 390-1 392 MHz (Earth-to-space) and 1 430-1 432 MHz (space-to-Earth).

3/1.17/1 Issue A – Resolution **745 (WRC-03)** *further resolves to invite ITU-R, as a matter of urgency*

"1 to continue studies, and to carry out tests and demonstrations to validate the studies on operational and technical means to facilitate sharing around 1.4 GHz, including the frequency band 1 390-1 392 MHz, between existing and currently planned services and FSS feeder links (Earth-to-space) for use by non-GSO satellite systems in the MSS with service links operating below 1 GHz"

3/1.17/1.1 Background

The frequency band 1 350-1 400 MHz is allocated on a primary basis in all Regions to the radiolocation service (RLS) and in Region 1 to the fixed service (FS) and mobile service (MS), among others. The band 1 370-1 400 MHz is in all Regions allocated on a secondary basis to the space research (passive) service (SRS (passive)) and Earth exploration-satellite (passive) service (EESS (passive)) by RR No. **5.339**. In addition, in some countries existing installations of the radio navigation service (RNS) may continue to operate in the band 1 350-1 400 MHz under RR No. **5.338**. The band 1 330-1 400 MHz is also used by the radio astronomy service (RAS) for observations of the red-shifted hydrogen line and RR No. **5.149** urges administrations to take all practicable steps to protect it from harmful interference.

3/1.17/1.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

List of relevant ITU-R Recommendations: ITU-R M.1463, ITU-R RS.1029-2.

Fixed service

The frequency band 1 350-1 400 MHz is in many countries intensively used for low-capacity long-haul radio relays, including some security applications. In this band the FS has evolved its applications globally, primarily for low-cost rural, point-to-multipoint systems in developing and developed countries, without practical sharing difficulties with other services.

Mobile service

The frequency band 1 350-1 400 MHz is used by transportable radio-relay systems in some countries which operate under the MS. These systems have characteristics which are comparable to point-to-point FS systems or directional stations of point-to-multipoint FS systems.

Radiolocation service

The frequency band 1 350-1 400 MHz is used by several administrations for ground-based, ship-borne or airborne long-range air surveillance radars. These radiolocation systems are globally deployed in significant numbers. Recommendation ITU-R M.1463 contains relevant radiolocation receiver characteristics.

Radionavigation service

No information on potentially affected RNS systems has been made available.

Radio astronomy service

For FSS (Earth-to-space) links (limited to feeder links of non-geostationary mobile-satellite systems with service links below 1 GHz) operating in the band 1 390-1 392 MHz, interference detrimental to radio astronomy in the band 1 330-1 400 MHz can be prevented by a combination of geographic separation and appropriate attenuation of unwanted emissions, so that the total data loss due to the (Earth-to-space) and (space-to-Earth) links does not exceed 2%.

Earth-exploration satellite service (EESS) (passive)

Regarding the impact on EESS (passive), Recommendation ITU-R RS.1029-2 contains the permissible interference levels and related time excess criteria or data availability criteria to the band 1 370-1 400 MHz. The acceptable interference power is –174 dBW in a reference bandwidth of 27 MHz not to be exceeded for more than 0.1% of the time.

Space research service (passive)

No information on potentially affected SRS (passive) systems has been made available.

3/1.17/1.3 Analysis of the results of studies

Fixed service

Sharing with the FS is feasible by applying geographical separation. Adequate separation distances shall be respected when an administration deploys an FSS earth station with respect to FS stations operating in the band 1 390-1 392 MHz so that the FSS earth station does not cause harmful interference to FS stations in the territory of other administrations.

Mobile service

Sharing with the MS would require geographical separation between transmitting FSS earth stations and mobile receivers. For mobile service systems in general, and transportable radio-relay systems in particular, sharing will not be feasible in and close to the territory of administrations using or planning to use MS systems.

Radiolocation service

Different types of radiolocation systems are operated in the band 1 350-1 400 MHz.

Sharing with aeronautical radiolocation systems is not feasible. Studies indicate that protection criteria for radiolocation receivers are exceeded between 38 dB under favourable conditions and 85 dB under worst-case conditions. Typical interference excess levels range between 52 and 75 dB.

Sharing with transportable ground-based or ship-borne radiolocation systems is not feasible.

For ground-based radiolocation systems in fixed locations, adequate separation distances need to be respected when an administration deploys an FSS earth station with respect to radiolocation stations operating in the band 1 350-1 400 MHz so that the FSS earth station does not cause harmful interference to radiolocation stations deployed in the territory of other administrations. Sharing studies conducted within ITU-R have shown separation distances between a ground-based radar and an FSS earth station of between 150 and 600 km, depending on the cases considered. Propagation paths over large bodies of water are likely to require higher distances. The high number of ground-based radiolocation systems deployed in all 3 Regions will make the deployment of MSS feeder link earth stations very difficult.

Radio astronomy service

For FSS (Earth-to-space) links operating in the band 1 390-1 392 MHz, interference detrimental to radio astronomy operations in the band 1 330-1 400 MHz can be avoided through geographic separation, which may prevent deployment of FSS earth stations in very large areas surrounding those radio astronomy stations.

The distance necessary for the protection of radio astronomy stations has been determined to be greater than 600 km for radio astronomy stations performing observations in the 1 330-1 400 MHz band.

Earth-exploration satellite service (EESS) (passive)

Operation of EESS (passive) is not feasible whenever an EESS (satellite) is in line of sight of an FSS earth station. In view of the global deployment of FSS earth stations, sharing will not be feasible.

3/1.17/2 Issue B – Resolution **745 (WRC-03)** *further resolves to invite ITU-R, as a matter of urgency*

"2 to conduct studies, and carry out tests and demonstrations to validate the studies on operational and technical means to facilitate sharing around 1.4 GHz, including the frequency band 1 430-1 432 MHz, between existing and currently planned services and FSS feeder links (space-to-Earth) for use by non-GSO satellite systems in the MSS with service links operating below 1 GHz"

3/1.17/2.1 Background

The band 1 427-1 429 MHz is allocated among other services to FS and MS except aeronautical mobile, on world wide basis. The band 1 429-1 452 MHz is allocated among other services to FS and MS expect aeronautical mobile in Region 1. In Regions 2 and 3, the band 1 429-1 452 MHz is allocated among other services to FS and MS.

In some countries the band 1 429-1 535 MHz is also allocated on a primary basis to the aeronautical mobile service exclusively for the purposes of aeronautical telemetry within the national territory by RR No. **5.342**.

The band 1 427-1 429 MHz is also allocated on a primary basis to the space operation service (Earth-to-space) in all Regions.

3/1.17/2.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

*List of relevant ITU-R Recommendations***:** ITU-R F.1108-4, ITU-R M.1459.

Fixed service

The frequency band 1 427-1 452 MHz is in many countries intensively used for low-capacity long-haul radio relays, including some security applications. In this band, the FS has evolved its applications globally, primarily for low-cost rural, point-to-multipoint systems in developing and developed countries, without practical sharing difficulties with other services.

Studies were performed using the fractional degradation in performance (FDP) criterion contained in Recommendation ITU-R F.1108-4 to derive pfd values for the protection of the FS from the FSS link (space-to-Earth).

Mobile service (including aeronautical mobile service)

Protection criteria and typical characteristics of aeronautical telemetry systems in the band 1 430-1 432 MHz fully comply with protection criteria and characteristics of systems presented in Recommendation ITU-R M.1459 for the 1 452-1 535 MHz frequency band.

The pfd produced at the Earth's surface by any non-GSO space station visible for any receiving aeronautical mobile station operating in accordance with RR No. **5.342** in the band 1 430-1 432 MHz, need to not exceed the following limits in any 4 kHz reference bandwidth:

-181	dB(W/m^2)	$0 \leq \theta \leq 4$
$-193 + 20 \log \theta$	dB(W/m^2)	$4 < \theta \leq 20$
$-213.3 + 35.6 \log \theta$	dB(W/m^2)	$20 < \theta \leq 60$
-150	dB(W/m^2)	$60 < \theta \leq 90$

where:

θ: angle of arrival (in degrees above the horizontal plane).

Space operation service

No information on potentially affected space operation service systems has been made available.

3/1.17/2.3 Analysis of the results of studies

Fixed service

ITU-R studies based on the FDP criterion have concluded that the following pfd limit should be adequate to protect the FS in bands near 1.4 GHz:

$$pfd_{limit} = -164 \text{ dB/(W/(m}^2 \cdot 4 \text{ kHz))}$$

This pfd limit, established to protect digital fixed wireless systems, is considered adequate to protect analogue fixed wireless systems. Actually required pfd limits are a function of the number of FSS links (space-to-Earth) but studies have shown that for most non-GSO systems the required value was around −164 dB/(W/(m^2 · 4 kHz)).

Mobile service

ITU-R studies showed that FSS links (space-to-Earth) in the band 1 430-1 432 MHz (MSS feeder links) operating at a pfd level of −164 dB(W/m^2) in any 4 kHz bandwidth exceed the specified protection criterion by 17 dB. Therefore, compatibility with FSS links (space-to-Earth) in the band 1 430-1 432 MHz is impossible.

3/1.17/3 **Issue C –** Resolution **745 (WRC-03)** *further resolves to invite ITU-R*, *as a matter of urgency*

"3 to carry out studies, including the measurement of emissions from equipment that would be employed in operational systems, to validate that the systems meet all requirements for the protection of passive services in the band 1 400-1 427 MHz from unwanted emissions from FSS feeder links around 1.4 GHz for non-GSO satellite systems in the MSS with service links operating below 1 GHz"

3/1.17/3.1 Background

The band 1 400-1 427 MHz is allocated to the EESS (passive), the RAS and the SRS (passive) on a worldwide basis. For the RAS, this band is crucial both for studies of the hydrogen line and for continuum observations.

For the EESS, the band 1 400-1 427 MHz is a vital resource for measuring salinity and other aspects of the Earth and its atmosphere. RR No. **5.340** prohibits all emissions in the band, emphasizing the particular importance of the band for the science community.

3/1.17/3.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

List of relevant ITU-R Recommendations: ITU-R RA.769-2, ITU-R RS.1029-2, ITU-R RA.1513-1, ITU-R S.1586, ITU-R RA.1631.

Radio astronomy service

Recommendation ITU-R RA.769-2 lists the threshold levels of interference detrimental to the RAS in the band 1 400-1 427 MHz. Recommendation ITU-R RA.1513-1 provides criteria for data loss to the RAS due to any one system. Recommendation ITU-R RA.1631 gives the RAS station antenna pattern and maximum gain to be considered in compatibility studies. From these values it is possible to derive epfd levels that should be respected by the feeder links of a single MSS network:

– an epfd limit of –259 dBW/m^2 in any 20 kHz bandwidth of the 1 400-1 427 MHz band for more than 98% of integration periods of 2 000 s at each radio astronomy station conducting spectral line observations in this band; and

– an epfd limit of –243 dBW/m^2 in the entire 1 400-1 427 MHz band for more than 98% of integration periods of 2 000 s at each radio astronomy station conducting continuum observations in this band.

For FSS links (Earth-to-space) operating in the band 1 390-1 392 MHz, interference detrimental to radio astronomy in the band 1 400-1 427 MHz can be prevented by a combination of geographic separation and appropriate attenuation of unwanted emissions, so that the total data loss due to the Earth-to-space link and the space-to-Earth link does not exceed 2%.

Earth-exploration satellite service (passive)

Regarding the impact on EESS (passive), Recommendation ITU-R RS.1029-2 contains the permissible interference levels and related time excess criteria or data availability criteria to the band 1 400-1 427 MHz. The acceptable interference power is –174 dBW in a reference bandwidth of 27 MHz not to be exceeded for more than 0.1% of the time. As the interference comes from several sources, ITU-R has decided to allocate 5% of this interference time to each of the FSS links below and above the band 1 400-1 427 MHz, respectively.

3/1.17/3.3 Analysis of the results of studies

Radio astronomy service

FSS space-to-Earth link

The application of Recommendation ITU-R S.1586 to a representative radio astronomy station leads to the following pfd limits, to be respected by each satellite of an MSS network with FSS links (space-to-Earth):

– a pfd limit of –201 dBW/m^2 in any 20 kHz at any radio astronomy station conducting observations in this band; and

– a pfd limit of –185 dBW/m^2 in 27 MHz at any radio astronomy station conducting observations in this band.

In order to accommodate full duplex telecommunications in two frequency channels separated by only 40 MHz, a post-transmitter filter is required on both the MSS satellites and the earth stations.

Studies have shown through laboratory tests and simulations that the combination of such a filter on the satellite, with Gaussian minimum shift keying (GMSK) modulation using a 300 kHz bandwidth and an output power of 3 W at the input of the antenna would lead to an amount of unwanted emissions at the antenna input of −90 dBW in the entire passive band, and –103 dBW in a 20 kHz bandwidth at 1 427 MHz. No measurements of emissions from equipment that would be employed in operational systems have been provided.

Assuming an antenna gain of –6 dBi and a distance of 1 000 km this leads to a pfd per satellite of −227 dBW/m^2 in the entire 1 400-1 427 MHz band and –240 dBW/m^2 in a 20 kHz bandwidth at 1 427 MHz. These numbers correspond to a margin of 40 dB with regard to the pfd limits determined above, which is largely sufficient to accommodate any difference that may appear between the laboratory tests/simulations and the real system in orbit.

FSS Earth-to-space link

For FSS links (Earth-to-space) operating in the band 1 390-1 392 MHz, interference detrimental to radio astronomy operations in the band 1 400-1 427 MHz can be prevented through a combination of geographic separation, and appropriate attenuation of unwanted emissions, which may be readily achievable for the limited number of FSS earth stations that would be implemented.

The distance necessary for the protection of radio astronomy stations has been determined to be in the order of 100 km for radio astronomy stations performing observations in the 1 400-1 427 MHz band. The 100 km separation distance was determined assuming that the FSS earth station unwanted emission levels were those necessary for the protection of the EESS (−63 dBW). Actual systems will emit a power that is up to 40 dB lower, leading to separation distances of the order of 7 km. The actual separation distance will therefore need to be calculated on a case-by-case basis.

Earth-exploration satellite service (passive)

Regarding FSS links (Earth-to-space), ITU-R studies concluded that an unwanted emission power limit of –63 dBW in the band 1 400-1 427 MHz at the antenna port of the FSS earth station would protect EESS passive sensors operating in the 1 400-1 427 MHz band from harmful interference. The actual required attenuation for a 100 kHz signal is 97 dB. Such a high unwanted emission attenuation level is unusual but considered feasible if modulation techniques with appropriate pulse shaping and tight hardware performance specifications are used in conjunction with a post amplifier filter. No measurements of emissions from equipment that would be employed in operational systems have been provided.

Regarding FSS links (space-to-Earth), ITU-R studies concluded that an unwanted emission power limit of –46 dBW in the band 1 400-1 427 MHz at the antenna port of the satellite would protect EESS passive sensors operating in the 1 400-1 427 MHz band from harmful interference. The actual required attenuation for a 100 kHz signal is 70 dB which is considered achievable.

3/1.17/4 **Issue D –** Resolution **745 (WRC-03)** *further resolves to invite ITU-R*, *as a matter of urgency*

"4 to study the power flux-density (pfd) values required to protect sensors of the EESS (passive) operating in the band 1 400-1 427 MHz"

3/1.17/4.1 Background

General items regarding protection of EESS (passive) are addressed in § 3/1.17/3. During WRC-03 it was considered necessary to specifically address pfd levels for protection of passive sensors in certain operational modes resulting in *resolves* 4 of Resolution **745 (WRC-03)**.

3/1.17/4.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

During the studies it became apparent that the required pfd values to protect sensors of the EESS (passive) are adequately covered by the unwanted emission power levels specified in § 3/1.17/3 to be applied within a reference bandwidth of 27 MHz.

3/1.17/4.3 Analysis of the results of studies

The specifications on FSS unwanted emission power levels contained in § 3/1.17/3.3 are also adequate to cover this issue.

3/1.17/5 Methods to satisfy the agenda item

Method 1

Suppression of the secondary FSS allocation for MSS feeder links in the frequency bands 1 390-1 392 MHz (Earth-to-space) and 1 430-1 432 MHz (space-to-Earth).

Advantages:

– Unconstrained operating conditions for all existing services.

– No harmful interference to aeronautical, ship-borne and ground based radiolocation receivers as well as the EESS (passive) operating below 1 400 MHz.

– No harmful interference to the aeronautical mobile service operating above 1 427 MHz.

– Avoidance of very constraining operating conditions for MSS feeder links.

Disadvantages:

No FSS allocation for MSS feeder links around 1.4 GHz.

3/1.17/6 Regulatory and procedural considerations

In applying Method 1, WRC-07 may consider the possible suppression of RR No. **5.339A** together with the possible suppression of Resolution **745 (WRC-03)**.

CHAPTER 4

FIXED SERVICE INCLUDING HAPS AND FIXED-SATELLITE SERVICE ABOVE 3 GHz

(Agenda items 1.8, 1.18 and 1.19)

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Agenda item 1.8

"to consider the results of ITU-R studies on technical sharing and regulatory provisions for the application of high altitude platform stations operating in the bands 27.5-28.35 GHz and 31-31.3 GHz in response to Resolution 145 (WRC-03), and for high altitude platform stations operating in the bands 47.2-47.5 GHz and 47.9-48.2 GHz in response to Resolution 122 (Rev.WRC-03)"

Executive summary

ITU-R has conducted the studies on technical sharing and regulatory provisions for high altitude platform stations (HAPS) in response to Resolutions **122 (Rev.WRC-03)** and **145 (WRC-03)**. The main results have arrived at the following methods to satisfy the agenda item.

– Revisions of Resolution **145 (WRC-03)** and relevant RR footnotes to identify a common 300 MHz segment within the 27.5-28.35 GHz band for use for HAPS in the fixed service (FS) and to re-align HAPS spectrum-related provisions.

– Suppression of Resolution **122 (Rev.WRC-03)** to be replaced by a new Resolution to address coordination mechanisms between systems using HAPS and other co-primary services in the 47-48 GHz range, and consequential changes to a relevant footnote.

Or alternatively; maintain Resolution **122 (Rev.WRC-03)** with revisions to facilitate sharing between systems using HAPS and other services or other systems in the FS in neighbouring countries.

For some of the Issues identified in the above Resolutions, study results provided in the ITU-R Recommendations would satisfy the requests from these Resolutions.

Resolution 145 (WRC-03) - Potential use of the bands 27.5-28.35 GHz and 31-31.3 GHz by high altitude platform stations (HAPS) in the fixed service

List of relevant ITU-R Recommendations (for Issues A to E under Resolution 145 (WRC-03))

Recommendations ITU-R F.1570, ITU-R SF.1601, ITU-R F.1607, ITU-R F.1609 and ITU-R F.1612.

4/1.8/1 Issue A – Resolution **145 (WRC-03)** *invites ITU-R*

"1 to continue to conduct studies, as a matter of urgency, and taking into account the requirements of other fixed-service systems and other services, on the feasibility of identifying a suitable and preferably a common 300 MHz segment of the band 27.5-28.35 GHz paired with the 300 MHz band at 31-31.3 GHz, for use by HAPS in the countries listed in Nos. **5.537A** and **5.543A** or countries in Region 2 planning provisional operation"

4/1.8/1.1 Background

RR No. **5.537A** permits the listed countries and Resolution **145 (WRC-03)** also permits Region 2 to use HAPS in a single 300 MHz sub-band within the 27.5-28.35 GHz band. This band is globally allocated to FS, FSS (uplink) and MS. In addition, the 27.5-27.82 GHz band is identified for use by high density applications in the FSS in Region 1 in accordance with RR No. **5.516B**.

4/1.8/1.2 Summary of technical and operational studies

Considerations in the frequency band 27.5-28.35 GHz are as follows.

– Harmonization of the identification of a common 300 MHz segment for HAPS would simplify use of the entire 27.5-28.35 GHz band and would minimize potential interference scenarios.

– There are a number of other existing/planned systems such as FS in the lower band to minimize the effect of rain attenuation. In some countries, this makes the use of the upper segment (28.05-28.35 GHz) of the band 27.5-28.35 GHz more preferable for HAPS use in the FS than the lower segment (27.5-27.8 GHz).

– ITU-R space radiocommunications stations database shows that there are many existing/planned networks in the FSS that use the band immediately above 28.35 GHz. Therefore, if HAPS uses the 27.5-27.8 GHz portion of the band, this would provide sufficient guardband to ensure that there are not unwanted emission concerns from HAPS to the FSS that operates in the 28.35-28.6 GHz band.

– High density applications in the FSS are identified in the frequency band 27.5-27.82 GHz, in Region 1, but no such applications are being provided today.

4/1.8/1.3 Analysis of the results of studies

Taking into account the above factors, a common 300 MHz segment for use by HAPS could be identified within either the lower portion (27.5-27.8 GHz) or the upper portion (28.05-28.35 GHz) of the band 27.5-28.35 GHz, in order to minimize potential impact on other systems in the FS sharing the same frequency bands or FSS operating in the band immediately above 28.35 GHz.

4/1.8/2 Issue B – Resolution **145 (WRC-03)** *invites ITU-R*

"2 to develop, one or more ITU-R Recommendations, technical sharing criteria or HAPS system design conditions that are necessary to ensure that HAPS applications in the fixed service operate successfully on a non-harmful interference, non-protected basis in the bands 27.5-28.35 GHz and 31-31.3 GHz"

4/1.8/2.1 Background

RR Nos. **5.537A** and **5.543A** and Resolution **145 (WRC-03)** permit use of 300 MHz of the FS allocation in the 27.5-28.35 GHz frequency band and the 31-31.3 GHz frequency band by HAPS applications on a "non-harmful interference, non-protected" basis.

4/1.8/2.2 Summary of technical and operational studies

ITU-R has conducted the following studies:

1) *Interference from systems using HAPS to the conventional fixed wireless access (FWA) system:*
Recommendation ITU-R F.1609 on the interference evaluation from HAPS systems to the conventional FWA systems has been revised to include a new example of interference evaluation as described in § 4/1.8/4.

2) *Interference from systems using HAPS to the GSO FSS system:*
Recommendation ITU-R SF.1601 on the interference evaluation methodology from downlink transmission of HAPS to the GSO uplink has been revised to include new examples of interference evaluation methodologies as described in § 4/1.8/3.

4/1.8/2.3 Analysis of the results of studies

Refer to § 4/1.8/3 and 4/1.8/4 below.

4/1.8/3 Issue C – Resolution **145 (WRC-03)** *invites ITU-R*

"3 to complete studies on the interference criteria and methodology for evaluating interference from the downlink (HAPS-to-ground direction) of systems using HAPS to the uplink of the GSO satellite networks in the FSS within the band 27.5-28.35 GHz, taking into account Recommendation ITU-R SF.1601 for the situations referred to in *considering l)*"

4/1.8/3.1 Background

The downlink transmission of systems using HAPS shall not cause harmful interference to the uplink of the GSO satellite networks in the 27.5-28.35 GHz band.

4/1.8/3.2 Summary of technical and operational studies

ITU-R has conducted studies on interference from downlink transmission of systems using HAPS to the GSO FSS networks in the 27.5-28.35 GHz band. The studies addressed in Recommendation ITU-R SF.1601 include two different methodologies for the interference evaluation as well as example results for the respective methodologies. One example indicates that the impact on the GSO FSS uplink by the HAPS downlink is calculated as the interference to noise ratio (*I*/*N*) of –20 dB or less.

4/1.8/3.3 Analysis of the results of studies

The interference from the HAPS downlink may be acceptable to the GSO FSS uplink with respect to the *I*/*N* evaluations considered in Recommendation ITU-R SF.1601.

4/1.8/4 Issue D – Resolution **145 (WRC-03)** *invites ITU-R*

"4 to study the regulatory provisions that might be needed in order to address those cases where the deployment of HAPS in the fixed service in the bands 27.5-28.35 GHz and 31-31.3 GHz in the territory of one administration may affect other administrations"

4/1.8/4.1 Background

Because of the high altitude of the platform, HAPS applications might need longer separation distance than do other systems in the FS with respect to interference to neighbouring countries.

4/1.8/4.2 Summary of technical and operational studies

ITU-R has conducted studies on interference from systems using HAPS to FWA systems in the FS. The results contained in Recommendations ITU-R F.1609 indicate that:

1) the interference from the ground stations for the HAPS systems in the 31 GHz band is comparable with that from the terrestrial stations of the conventional FWA systems;

2) the interference from the HAPS in the 28 GHz band is considerably larger because of the high altitude in comparison with the terrestrial stations of the conventional FWA systems. An example of interference evaluation from downlink transmission shows that the conventional FWA has to be separated at least 70 km from the nadir point of the HAPS (15 km from the edge of the HAPS service area) in order to share the same frequency band, assuming the typical elevation angle distributions of the FWA subscriber stations.

4/1.8/4.3 Analysis of the results of studies

Resolution **145 (WRC-03)** contains provisions in *resolves* 4; *invites administrations;* and *instructs the Director of the Radiocommunication Bureau. Resolves* 4 provides requirement for obtaining explicit agreement between concerned administrations. *Invites administrations* and *instructs the Director of the Radiocommunication Bureau* provides for notification and publication of HAPS information in advance.

Taking into account the interference studies from HAPS to terrestrial stations in the FS, these provisions in Resolution **145 (WRC-03)** can address the cases where the deployment of HAPS in the territory of one administration may affect other administrations. To refine these provisions further, some revisions would be required in implementation or applications of these provisions.

4/1.8/5 **Issue E –** Resolution **145 (WRC-03)** *invites ITU-R*

"5 to continue to carry out studies on the appropriate interference mitigation techniques for the situations referred to in *considering j)*"

4/1.8/5.1 Background

In order to minimize the impact to other systems operating in the same or adjacent bands of the HAPS systems, it is required to investigate any interference mitigation techniques applicable for the HAPS systems.

4/1.8/5.2 Summary of technical and operational studies

In ITU-R, a study on digital beam forming antennas is ongoing as one of the effective interference mitigation techniques to be applied to HAPS airships. Simulations of these antenna patterns, considering some practical conditions, show that they would have lower side-lobe levels than those of conventional reference patterns. On this basis Recommendation ITU-R F.1607 is being revised.

4/1.8/5.3 Analysis of the results of studies

Revision of Recommendation ITU-R F.1607, now under study, will provide further results.

Resolution 122 (Rev.WRC-03) – Use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz by high altitude platform stations (HAPS) in the fixed service and by other services

List of relevant ITU-R Recommendations (for Issues F to H under Resolution 122 (Rev.WRC-03))

Recommendations ITU-R SF.1481, ITU-R F.1500 and ITU-R F.1501

4/1.8/6 **Issue F –** Resolution **122 (Rev.WRC-03)** *invites ITU-R*

"1 to study, as a matter of urgency, power limitations applicable for HAPS ground stations to facilitate sharing with space station receivers"

4/1.8/6.1 Background

The ITU has been considering the implications of HAPS in the fixed service in the 47.2-47.5 GHz and 47.9-48.2 GHz bands since WRC-97 first made provision for the operation of HAPS within the FS. Studies have been ongoing under several versions of Resolution **122** adopted at past WRCs.

The main results of studies undertaken to date regarding HAPS in these bands are contained in Recommendation ITU-R SF.1481. This Recommendation indicates that co-frequency operations between HAPS and systems in the FSS may be feasible in the 47.2-47.5 GHz and 47.9-48.2 GHz bands, even while noting that there may be a need to develop the maximum allowable power flux-density at satellites on the GSO due to aggregate interference caused by ground user terminals of HAPS networks. The Recommendation indicates that sharing would be difficult in applications involving ubiquitous deployment of HAPS in the FS in the same area as ubiquitously deployed FSS earth stations[*]. Under the revision to Resolution **122** that was approved at WRC-03, coexistence between HAPS in the FS and the FSS at 47.2-47.5 GHz and 47.9-48.2 GHz is feasible, as administrations were encouraged to facilitate interservice coordination. Nevertheless, the ITU-R was invited to study power limitations on HAPS ground stations to facilitate sharing with space station receivers.

4/1.8/6.2 Summary of technical and operational studies

ITU-R has conducted a study on appropriate maximum power level for HAPS ground stations to facilitate frequency sharing between HAPS ground stations and FSS space stations in the bands 47.2-47.5 GHz and 47.9-48.2 GHz.

4/1.8/6.3 Analysis of the results of studies

In clear sky conditions, a transmit power density reduction of 5 dB at the HAPS ground stations would avoid interference with the space receiver of the FSS space station. The HAPS ground station transmit power, from which the 5 dB reductions would be taken, for several different cases of geometrical relationships between HAPS ground stations and FSS communication links, has been evaluated for a range from a minimum of –8.2 dBW to a maximum of –1.5 dBW in a 2 MHz channel bandwidth. These power levels are presented in Recommendation ITU-R F.1500. In rainy conditions, with an automatic transmit power control feature in HAPS ground stations, restoration of power can be made to maintain adequate link margins.

4/1.8/7 Issue G – Resolution **122 (Rev.WRC-03)** *invites ITU-R*

“2 to study the regulatory provisions that might be needed in order to address those cases where the deployment of HAPS in the territory of one administration may affect other administrations”

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[*] There are plans for some ubiquitous HAPS system deployment in the fixed service in these bands.

4/1.8/7.1 Background

In the WRC-03 revision of Resolution **122**, the ITU-R was invited to study regulatory provisions to address deployment of HAPS in the FS near country borders. The possibility of interference to FSS spacecraft from HAPS and border area coordination matters in the FS are two areas where the deployment of HAPS is not a strictly national issue. Resolution **122 (Rev.WRC-03)** provisionally applies the procedures of Article **9** for coordination between satellite systems and systems using HAPS in the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz.

4/1.8/7.2 Summary of technical and operational studies

A sharing study has been reported with proposed threshold levels at international borders for HAPS operating in 47.2-47.5 GHz and 47.9-48.2 GHz bands to protect fixed services in neighbouring countries. It is foreseen to develop an ITU-R Recommendation with specific pfd limits to protect fixed service in a neighbouring country. Those threshold levels could only be reduced by mutual agreement of those concerned administrations. This Recommendation would also possibly clarify the notification procedure with related compliance requirements.

4/1.8/7.3 Analysis of the results of studies

WRC-03 contemplated that the issue of interference between the FSS satellite and HAPS networks be addressed through coordination using RR Articles **9** and **11**. Should WRC-07 decide not to retain Resolution **122 (Rev.WRC-03)**, it could decide to include a provision making the use of the FS allocation for HAPS subject to a new resolution that applies a coordination mechanism to any future coordination cases. These cases could otherwise be addressed on a provisional basis in RR Article **9** in accordance with Resolution **122 (Rev.WRC-03).**

However, it should be noted that an alternative notification and registration mechanism, including provision for examination by the Bureau, could be applied taking into account the study results stated in § 4/1.8/7.2. Therefore, if WRC-07 decides to maintain Resolution **122 (Rev.WRC-03)**, it could revise the Resolution to provide such procedures.

4/1.8/8 **Issue H** – Resolution **122 (Rev.WRC-03)** *invites ITU-R*

"3 to continue to carry out studies in a most efficient and harmonized manner on the appropriate technical sharing criteria for the situations referred to in *considering k)* and *m)*, taking into account the operational environments and the requirements of systems in the FSS"

4/1.8/8.1 Background

Spectrum allocations are established to meet the long-term requirements for confidence and surety to facilitate the development of new technologies. They are prerequisites to facilitate major investment by manufacturers for the development of infrastructure and by others integrating streams of technologies and applications in planning and establishing infrastructure for ultimate service applications. While there may have been a slow-down in the research and development activity for HAPS in the recent past, it is evident that research and test pilot project programs are proceeding again. They are being actively explored in several countries.

4/1.8/8.2 Summary of technical and operational studies

Recommendation ITU-R SF.1481-1 concluded that it is not feasible for some types of FSS earth stations to share with HAPS in the same service area. This conclusion (in Table 18 in § 5 Conclusions in Annex 4) affects ubiquitous terminals to be deployed in HAPS major markets and also service delivery in adjacent coverage areas. Indeed the placement of FSS earth stations with small antenna diameters could affect adversely service at nearby HAPS terminals, as described within the scope of separation distances in the Recommendation. Further, for these small-diameter FSS earth stations, it is not expected that significant improvement could be obtained in the usual forms of mitigation techniques and equipment adjustments. Larger-diameter FSS earth station antennas, on the order of 2.5 m in diameter, such as those used for gateway/HUB applications in FSS systems/networks for BSS feeder links as shown in Annex 3 to this Recommendation, do not have the same adverse effect on ubiquitously-deployed HAPS terminals.

Recommendation ITU-R F.1500 describes the preferred characteristics of a HAPS system, including example potential band plans. These band plans provide opportunities, e.g. 2 × 150 MHz applications, which can serve as reference system characteristics for ubiquitous HAPS terminals in the 47.2-47.5 GHz and 47.9-48.2 GHz bands.

Recommendation ITU-R F.1501 provides the basis for the determination of coordination distance for systems involving HAPS sharing the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz with other systems in the fixed service.

A study has also been conducted on sharing between HAPS systems in the 47.2-47.5 GHz and 47.9-48.2 GHz bands and the radio astronomy service (RAS) in the adjoining 48.94-49.04 GHz band. Under the following conditions, the derived minimum separation distance between a RAS antenna and the nadir of a HAPS platform is 51 km.

– The parameters of the HAPS system are taken from Recommendation ITU-R F.1500.
– Additionally, total stop band rejection of more than 95 dB is assumed for the protection of the 49 GHz RAS band, which could be composed of 2 filters, i.e. a 12-section Chebyshev waveguide pass band filter (with a stop band rejection ratio of better than 70 dB) and an integrated 5 section Chebyshev stop band (notch) filter (with a 25 dB notch depth within the 100 MHz stop band).

A new ITU-R Recommendation on this topic is envisaged.

4/1.8/8.3 Analysis of the results of studies

Studies have shown that band planning is a recognized mitigation application which could facilitate international and national coordination and potentially provide an opportunity for some coexistence in the use of the bands between FSS applications and systems using HAPS in the FS.

4/1.8/9 Methods to satisfy the agenda item

4/1.8/9.1 Method to satisfy Issues under Resolution 145 (WRC-03)

For Issue A, a common 300 MHz segment may be identified by WRC-07 in either the lower portion (27.5-27.8 GHz) or the upper portion (28.05-28.35 GHz) of the band 27.5-28.35 GHz.

For Issues B, C, D and E, on going ITU-R studies would satisfy the requests identified under Resolution **145 (WRC-03)** with no implication of WRC-07 or future WRCs.

4/1.8/9.2 Methods to satisfy Issues under Resolution 122 (Rev.WRC-03)

4/1.8/9.2.1 Method A – Replacement of Resolution 122 (Rev.WRC-03) with a new WRC Resolution

Under the revision to Resolution **122** that was approved at WRC-03, coexistence between the FSS and the HAPS in the FS at 47.2-47.5 GHz and 47.9-48.2 GHz is feasible, as administrations were encouraged to facilitate interservice coordination. The issue of interference between the FSS satellite and HAPS networks can be addressed through coordination using RR Articles **9** and **11**. In this way, Issues F, G, and H are all addressed. As a result, Resolution **122 (Rev.WRC-03)** can be suppressed.

With the suppression of Resolution **122 (Rev.WRC-03),** HAPS systems will need to be made subject to the provisions of RR Article **9** to ensure coordination with the FSS at 47 GHz. RR Nos. **9.17** and **9.18**, which apply for the coordination of terrestrial stations, including HAPS, with earth stations, are currently applicable without having to be called out in a footnote to RR Article **5** rather than revise all of RR Article **9** to address the single unaddressed coordination case of transmitting HAPS ground-based stations with receiving space stations of the FSS, when the HAPS ground station appears in the coverage area of a satellite network, it may be preferable to treat this case through a new WRC Resolution that would be referenced in RR No. **5.552A** (see Annex 1.8-2).

An equitable means of addressing the suppression of the provision of Resolution **122 (Rev.WRC-03)** that instructs the BR to maintain HAPS notices received prior to 22 November 1997 "until a date to be decided by a future WRC" will also be needed. One method of addressing this need could be to instruct the Bureau to retain all notices concerning HAPS that are presently maintained in the MIFR only by virtue of *instructs the Director of the Radiocommunication Bureau* 1 of Resolution **122 (Rev.WRC-03)** only until 1 January [2010], unless the notifying administration earlier informs the Bureau that the notified assignments have been brought into use.

Advantages:

– Ends WRC consideration of 47 GHz band HAPS sharing issues.

– Clarifies the regulatory/procedural status of existing and new filings in 47 GHz HAPS

Disadvantage:

– None.

4/1.8/9.2.2 Method B – Maintaining Resolution 122 (Rev.WRC-03) with certain revisions

The 47.2-47.5 GHz and 47.9-48.2 GHz bands represent the only designated use of a portion of a spectrum as a co-primary fixed service allocation to provide broadband applications for which a number of administrations have notified potential HAPS systems to the ITU Radiocommunication Bureau. Whilst some administrations may have access to use the 28-31 GHz band for particular applications, this cannot be said to be the same for others.

Thus it is important to retain Radio Regulations provision for the effective development in the long term of HAPS systems in the 47-48 GHz band taking full account of the circumstances of the initial designation, in particular, RR Nos. **5.552** and **5.552A**. The designation for HAPS in this spectrum range recognized frequency sharing between FS using HAPS and BSS feeder-link applications. This could apply also to gateway/hub terminals in the FSS, but not to small-diameter FSS user terminals. It also needs to be appreciated that the specific designation provides for 2 × 300 MHz attribution for up and down service links for HAPS.

Resolution **122 (Rev.WRC-03)** is to be reviewed and appropriately modified at WRC-07, for example, in the following manner.

Administrations would be urged to limit assignments for HAPS user terminals to 150 MHz within each of the 47.2-47.5 GHz and 47.9-48.2 GHz bands in the fixed service, and should refrain from assigning the same bands for use by small-diameter, ubiquitously-deployed user terminals in the FSS. This approach could facilitate sharing opportunities between FSS applications with small, ubiquitously-deployed terminals and HAPS services, extending the already accepted sharing beyond HAPS and BSS feeder links/FSS gateway/HUB-type applications, accordingly.

The modified provisions, with encouragement of band planning, between the co-primary services should enable deployment of HAPS gateway and ubiquitous terminals and FSS to proceed coherently in the longer term.

The contents of the modified Resolution **122** would further include:

1) Obligations for 5 dB power density reduction of a HAPS ground station to avoid interference to space stations in the FSS.

2) The conditions for avoidance of unwanted emissions to the RAS in the 48.94-49.04 GHz band.

3) The technical and regulatory requirements for protection of fixed services in neighbouring countries (see § 4/1.8/7.2).

The development of new Recommendations on the above three subjects are proceeding in the ITU-R, responding to the studies identified in Resolution **122 (Rev.WRC-03)**.

The status of old HAPS filings and some future FSS filings need to be addressed and suitably resolved at WRC-07. This would include the adoption of provisions ending the maintenance of notices concerning HAPS that were received by the Bureau prior to 22 November 1997 and provisionally recorded in the Master International Frequency Register, and the removal of current restrictions on the acceptance of notices from, and examination of, FSS networks and systems.

In this way, Issues F, G, and H under current Resolution **122 (Rev.WRC-03)** are all addressed.

Advantages:

– Simplified notification and coordination and compliance information procedure with exchange of specified data and information exchange.

– Reduction in coordination effort, time and resource use of administrations, system operators and the Bureau.

Disadvantages:

– None.

4/1.8/10 Regulatory and procedural considerations

4/1.8/10.1 Resolution 145 (WRC-03)

An example of the modification to RR No. **5.537A** that would reference to the revised Resolution **145** follows:

MOD

5.537A In Bhutan, Korea (Rep. of), the Russian Federation, Indonesia, Iran (Islamic Republic of), Japan, Kazakhstan, Lesotho, Malaysia, Maldives, Mongolia, Myanmar, Uzbekistan, Pakistan, the Philippines, Kyrgyzstan, the Dem. People’s Rep. of Korea, Sri Lanka, Thailand and Viet Nam, the allocation to the fixed service in the band ~~27.5-28.35~~ [27.5-27.8] [28.05-28.35] GHz may also be used by high altitude platform stations (HAPS) within the territory of these countries~~. The use of HAPS within the band 27.5-28.35 GHz is limited, within the territory of the countries listed above, to a single 300 MHz sub-band.~~ Such use of 300 MHz of the fixed-service allocation by HAPS in the above countries is further limited to operation in the HAPS-to-ground direction and shall not cause harmful interference to, nor claim protection from, other types of fixed-service systems or other co-primary services. Furthermore, the development of these other services shall not be constrained by HAPS. See Resolution **145 (Rev.WRC-~~03~~07)**.

Note: With respect to the [ ], in the above-mentioned provision and Resolution in Annex 1.8-1, a common 300 MHz segment could be identified by WRC-07 in either the lower portion (27.5-27.8 GHz) or the upper portion (28.05-28.35 GHz) of the band 27.5-28.35 GHz.

RR No. **5.543A** would also need to be modified to update the reference to Resolution **145 (WRC-03)**.

Resolution 145 (WRC-03)

An example of the revisions to Resolution **145 (WRC-03)** that would need to be made to reflect the decision on the location of the 300 MHz, either 27.5-27.8 GHz or 28.05-28.35 GHz, is provided in Annex 1.8-1.

4/1.8/10.2 Resolution 122 (Rev.WRC-03)

4/1.8/10.2.1 Method A

There are no regulatory and procedural considerations that are not described in § 4/1.8/9.2.

An example of the modification to RR No. **5.552A** that would reference to the new coordination resolution and pre-WRC-97 HAPS notices follows:

MOD

5.552A The allocation to the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz is designated for use by high altitude platform stations. The use of the bands 47.2-47.5 GHz and 47.9-48.2 GHz by high altitude platforms in the fixed service is subject to the provisions of Resolution **[47/48GHz HAPS] (WRC-07)** ~~Resolution **122 (WRC-97)**[*].~~ All notices for high altitude platform stations in these bands that were filed with the Bureau prior to 22 November 1997 shall be cancelled as of 1 January [2010] unless the notifying administration informs the Bureau before this date that the notified assignments have been brought into use. (WRC-~~97~~07)

Resolution [47/48GHz HAPS] (WRC-07) – An example of the new Resolution to address the coordination case not already in RR Article **9** is provided in Annex 1.8-2.

4/1.8/10.2.2 Method B

RR Nos. **5.552** and **5.552A** would remain unchanged including the reference to **Resolution 122 (Rev.WRC-03)** in RR No. **5.552A**.

Modifications to Resolution **122 (Rev.WRC-03)** are required to provide for the necessary and specific operational conditions to be observed by HAPS as stated in § 4/1.8/9.2.2 and for spectrum compliance requirements as a complement to RR No. **5.552A** for operations in the 47.2-47.5 GHz and 47.9-48.2 GHz bands.

Provisions, would then be included for notification of information and data related to system characteristics of the particular HAPS system comparable to the type of information and data presented for another HAPS service deployment under Resolution **221 (Rev.WRC-03)**.

Some modifications to RR Article **11** would be required and presented in the proposals to WRC-07 accordingly.

~~[*] *Note by the Secretariat:* This Resolution was revised by WRC-03.~~

Annex 1.8-1

Example of draft modifications to Resolution 145 (WRC-03)

MOD

RESOLUTION 145 (~~WRC-03~~Rev.WRC-07)

Potential use of the bands ~~27.5-28.35~~ [27.5-27.8] [28.05-28.35] GHz and 31-31.3 GHz by high altitude platform stations (HAPS) in the fixed service

The World Radiocommunication Conference (Geneva, 2007~~3~~),

considering

a) that WRC-97 made provision for the operation of HAPS, also known as stratospheric repeaters, within a 2 × 300 MHz portion of the fixed-service allocation in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

b) that WRC-97 adopted No. **4.15A** specifying that transmissions to or from HAPS shall be limited to the bands specifically identified in Article **5**;

c) that at WRC-2000, several countries in Region 3 and one country in Region 1 expressed a need for a lower frequency band for HAPS due to the excessive rain attenuation that occurs at 47 GHz in these countries;

d) that ~~at the present Conference,~~ some countries in Region 2 have also expressed an interest in using a frequency range lower than those referred to in *considering a)*;

e) that, in order to accommodate the need expressed by the countries referred to in *considering c)*, WRC-2000 adopted Nos. **5.537A** and **5.543A**, which were modified at WRC-03 and then again at WRC-07 ~~this Conference~~ to permit the use of HAPS in the fixed service ~~within 300 MHz of spectrum~~ in the band ~~27.5-28.35~~ [27.5-27.8][28.05-28.35] GHz and in the band 31-31.3 GHz in certain Region 1 and 3 countries ~~and in one Region 1 country~~ on a non-harmful interference, non-protection basis;

f) that the bands ~~27.5-28.35~~ [27.5-27.8][28.05-28.35] GHz and 31-31.3 GHz are already heavily used or planned to be used by a number of different services and a number of other types of applications in the fixed service;

g) that while the decision to deploy HAPS can be taken on a national basis, such deployment may affect neighbouring administrations, particularly in small countries;

h) that the 31.3-31.8 GHz band is allocated to the radio astronomy, Earth exploration-satellite (passive) and space research (passive) services, and that WRC-03 ~~this Conference~~ amended No. **5.543A** to specify signal levels that would protect satellite passive services and radio astronomy stations;

i) that ITU-R has conducted studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the bands ~~27.5-28.35~~ [27.5-27.8][28.05-28.35] GHz and 31-31.3 GHz leading to Recommendation ITU-R F.1609;

j) that results of some ITU-R studies indicate that, in the bands ~~27.5-28.35~~ [27.5-27.8][28.05-28.35] GHz and 31-31.3 GHz, sharing between fixed-service systems using HAPS and other conventional fixed-service systems in the same area will require appropriate interference mitigation techniques to be developed and implemented;

k) that ITU-R has conducted studies dealing with compatibility between systems using HAPS and the passive services in the 31.3-31.8 GHz band leading to Recommendations ITU-R F.1570 and ITU-R F.1612;

l) that ITU-R has produced Recommendation ITU-R SF.1601 containing ~~a~~ methodologies~~y~~ for evaluating interference from the fixed-service system using HAPS into GSO FSS systems in the band ~~27.5-28.35~~ [27.5-27.8][28.05-28.35] GHz ~~in order to facilitate further studies~~;

m) that HAPS technical ~~and regulatory~~ issues should continue to be studied in order to determine appropriate measures for protecting the fixed service and other co-primary services in the band ~~27.5-28.35~~ [27.5-27.8][28.05-28.35] GHz~~;~~,

~~*n)* that pending the completion of studies, administrations in Region 2 may wish to consider deployment of HAPS systems in the fixed service within 300 MHz of spectrum at 27.5-28.35 GHz and in 300 MHz of spectrum at 31-31.3 GHz and to have some provisional means by which to authorize such use of HAPS in their territories,~~

noting

that systems using HAPS may operate in the bands ~~27.5-28.35~~ [27.5-27.8][28.05-28.35] GHz and 31-31.3 GHz under No. **4.4**,

resolves

~~1 to invite WRC-07 to review the results of the studies specified below and consider appropriate refinement of the regulatory provisions for the use of HAPS within the bands 27.5-28.35 GHz and 31-31.3 GHz;~~

1~~2~~ that, notwithstanding No. **4.15A**, in Region 2 the use of HAPS within the fixed-service allocations within the ~~27.5-28.35~~[27.5-27.8] [28.05-28.35] GHz and 31-31.3 GHz bands shall ~~be limited, pending the completion of the studies specified in *invites ITU-R* 1 below, to 300 MHz in each band, that such use shall~~ not cause harmful interference to, nor claim protection from, other stations of services operating in accordance with the Table of Frequency Allocations of Article **5**, and, further, that the development of these other services shall proceed without constraints by HAPS operating pursuant to this Resolution;

2~~3~~ that~~, pursuant to *resolves* 2 above,~~ any use by HAPS of the fixed-service allocation at ~~27.5-28.35~~[27.5-27.8] [28.05-28.35] GHz pursuant to *resolves* 1 above shall be limited to operation in the HAPS-to-ground direction, and that any use by HAPS of the fixed-service allocation at 31-31.3 GHz shall be limited to operation in the ground-to-HAPS direction;

3 that systems using HAPS in the band 31-31.3 GHz, in accordance with *resolves* 1 above, shall not cause harmful interference to the radio astronomy service having a primary allocation in the band 31.3-31.8 GHz, taking into account the protection criterion given in the relevant ITU-R Recommendation in the RA series. In order to ensure the protection of satellite passive services, the level of unwanted power density into the HAPS ground station antenna in the band 31.3-31.8 GHz shall be limited to –106 dB(W/MHz) under clear-sky conditions and may be increased up to –100 dB(W/MHz) under rainy conditions to take account of rain attenuation, provided that effective impact on the passive satellite does not exceed the impact under clear-sky conditions as given above;

4 that~~, on a provisional basis,~~ the administrations listed in Nos. **5.537A** and **5.543A** which intend to implement systems using HAPS in the fixed service in the bands ~~27.5-28.35~~ [27.5-27.8] [28.05-28.35] GHz and 31-31.3 GHz shall seek explicit agreement of concerned administrations with regard to their stations of primary services to ensure that the conditions in Nos. **5.537A** and **5.543A** are met, and those administrations in Region 2 which intend to implement systems using HAPS in the fixed service in these bands ~~27.5-28.35 GHz and 31-31.3 GHz~~ shall seek explicit agreement of concerned administrations with regard to their ~~primary services~~ stations of services operating in accordance with the Table of Frequency Allocations of Article **5**~~services~~ to ensure that the conditions in ~~Nos. **5.537A, 5.543A**,~~ *resolves* 1~~2~~ and *resolves* 3~~5~~ are met;

~~5 that systems using HAPS in the band 31-31.3 GHz, in accordance with *resolves*~~ 1~~2 above, shall not cause harmful interference to the radio astronomy service having a primary allocation in the band 31.3-31.8 GHz, taking into account the protection criterion given in Recommendation ITU-R RA.769. In order to ensure the protection of satellite passive services, the level of unwanted power density into the HAPS ground station antenna in the band 31.3-31.8 GHz shall be limited to –106 dB(W/MHz) under clear-sky conditions and may be increased up to –100 dB(W/MHz) under rainy conditions to take account of rain attenuation, provided that effective impact on the passive satellite does not exceed the impact under clear-sky conditions as given above;~~

5 that administrations planning to implement a HAPS system pursuant to *resolves* 1 above shall notify the frequency assignment(s) by submitting all mandatory elements of Appendix **4**[1] to the Radiocommunication Bureau for the examination of compliance with *resolves* 3 and 4 above,

[1] Additional data elements necessary for the Bureau's examination may need to be developed and included in Appendix **4**. Calculation methods and limits will also need to be developed.

~~*invites ITU-R*~~

~~1 to continue to conduct studies, as a matter of urgency, and taking into account the requirements of other fixed-service systems and other services, on the feasibility of identifying a suitable and preferably a common 300 MHz segment of the band 27.5-28.35 GHz paired with the 300 MHz band at 31-31.3 GHz, for use by HAPS in the countries listed in Nos. **5.537A** and **5.543A** or countries in Region 2 planning provisional operation;~~

~~2 to develop, one or more ITU-R Recommendations, technical sharing criteria or HAPS system design conditions that are necessary to ensure that HAPS applications in the fixed service operate successfully on a non-harmful interference, non-protected basis in the bands 27.5-28.35 GHz and 31-31.3 GHz;~~

~~3 to complete studies on the interference criteria and methodology for evaluating interference from the downlink (HAPS-to-ground direction) of systems using HAPS to the uplink of the GSO satellite networks in the FSS within the band 27.5-28.35 GHz, taking into account Recommendation ITU-R SF.1601 for the situations referred to in *considering l)*;~~

~~4 to study the regulatory provisions that might be needed in order to address those cases where the deployment of HAPS in the fixed service in the bands 27.5-28.35 GHz and 31-31.3 GHz in the territory of one administration may affect other administrations;~~

~~5 to continue to carry out studies on the appropriate interference mitigation techniques for the situations referred to in *considering j)*,~~

~~*invites administrations,*~~

~~to advise the Radiocommunications Bureau of their intention to implement HAPS systems within the band 27.5-28.35 GHz and in the band 31-31.3 GHz, whether in countries listed in Nos. **5.537A** and **5.543A** or in accordance with *resolves 2*, and to specify the frequency bands (up to 300 MHz each within the 27.5-28.35 GHz and 31-31.3 GHz bands) they intend to use for such systems,~~

instructs the Radiocommunication Bureau

to publish in the International Frequency Information Circular (BR IFIC) a list of administrations who have so advised, and to publish the information on HAPS implementation received from administrations which intend to implement systems using HAPS in the fixed service in the bands ~~27.5-28.35~~[27.5-27.8] [28.05-28.35] GHz and 31-31.3 GHz.

Annex 1.8-2

Example of draft Resolution [47/48GHz HAPS] (WRC-07)

ADD

RESOLUTION [47/48GHz HAPS] (WRC-07)

Additional coordination mechanism to be applied between high altitude platform stations (HAPS) in the fixed service and other services in the bands 47.2-47.5 GHz and 47.9-48.2 GHz

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the band 47.2-50.2 GHz is allocated to the fixed, mobile and fixed-satellite services on a co-primary basis;

b) that WRC-97 made provision for operation of HAPS, also known as stratospheric repeaters, within the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

c) that Recommendation ITU-R F.1500 contains the characteristics of systems in the fixed service using HAPS;

d) that Recommendation ITU-R SF.1481-1 contains information on frequency sharing between systems in the fixed service using high-altitude platform stations and satellite systems in the geostationary orbit in the fixed-satellite service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

e) that while the decision to deploy HAPS can be taken on a national basis, such deployment, may affect neighbouring administrations;

f) that ITU-R has completed studies dealing with sharing between systems using HAPS in the fixed service and other types of systems in the fixed service in the bands 47.2-47.5 GHz and 47.9-48.2 GHz,

recognizing

a) that the procedures of Article **9** have been applied on a provisional basis from the end of WRC-97 through the end of WRC-07 for coordination between satellite systems and systems using HAPS in the bands 47.2-47.5 GHz and 47.9-48.2 GHz;

b) that with the suppression of Resolution **122 (Rev.WRC-03)** as of the end of WRC-07, there is a need to provide coordination provisions between satellite systems and systems using HAPS in the bands 47.2-47.5 GHz and 47.9-48.2 GHz in cases not presently covered under the procedures of Article **9**;

c) that Nos. **9.17** and **9.18** apply for the coordination of terrestrial stations, including HAPS, with earth stations, and vice versa;

d) that the coordination scenario involving a transmitting station in the fixed service which is part of a high altitude platform network as defined by No. **1.66A**, and other administrations with frequency assignments for existing or planned space stations in any frequency band in which the high altitude platform station network is to operate, is not presently addressed in Section II of Article **9**,

resolves

1 to encourage administrations to facilitate coordination between systems in the fixed service using HAPS operating in the bands 47.2-47.5 GHz and 47.9-48.2 GHz and systems of the co-primary satellite services in the same bands;

2 that, before an administration notifies to the Bureau or brings into use a frequency assignment in the bands 47.2-47.5 GHz and/or 47.9-48.2 GHz for a transmitting station in the fixed service which is part of a high altitude platform network as defined by No. **1.66A**, it shall request and effect coordination with other administrations with frequency assignments for existing or planned space stations in any frequency band in which the high altitude platform station network is to operate;

3 that any administration requesting coordination pursuant to *resolves* 2 above shall send its request to the Bureau, together with the appropriate information listed in Appendix **4**;

4 that any administration having received a request for coordination made under *resolves* 2 above shall promptly examine the matter with regard to interference which may be caused to its own assignments, using relevant ITU-R Recommendations for guidance on interference calculation methods and criteria;

5 that if, following its action under *resolves* 4 above, the administration with which coordination was sought under *resolves* 2 does not agree to the request for coordination, it shall, within four months of the date of publication of the BR IFIC under No. **9.38**, inform the requesting administration of its disagreement, and shall provide information concerning its own assignments upon which that disagreement is based, including suggestions as it is able to offer with a view to satisfactory resolution of the matter, to the requesting administration with a copy to the Bureau;

6 that Nos. **9.53** through **9.55** and Nos. **9.58** and **9.59** shall apply or be applied, as appropriate, to coordinations initiated pursuant to this Resolution,

instructs the Director of the Radiocommunication Bureau

1 to treat complete coordination information provided to it under *resolves* 3 above in the manner in which No. **9.34** directs the Bureau to treat complete information sent under No. **9.30** or No. **9.32**;

2 to apply No. **9.40A** if the information provided to it under *resolves* 3 above is found to be incomplete.

Agenda item 1.18*

"to review pfd limits in the band 17.7-19.7 GHz for satellite systems using highly inclined orbits, in accordance with Resolution 141 (WRC-03)"

Executive summary

ITU-R has conducted the studies in response to Resolution **141 (WRC-03)** to determine whether the current power flux-density (pfd) limits in RR Article **21** for non-GSO systems in the fixed-satellite service (FSS) using highly inclined orbits (HIO) having an apogee altitude greater than 18 000 km and orbital inclination between 35° and 145° are adequate to protect the fixed service (FS) in the 17.7-19.7 GHz band without unduly constraining the use of these non-GSO systems. The main results have arrived at the following three methods to satisfy the agenda item:

– no change to the current RR Article **21** mask applicable to non-GSO FSS systems using HIO;

– no change to the current RR Article **21** mask but, for non-GSO FSS systems using HIO, to mandate the implementation of the satellite antenna roll-off characteristics from Recommendation ITU-R S.672, and additional FSS operational requirements such as the specification of a minimum satellite transmit boresight elevation angle;

– to add a more stringent pfd mask applicable to HIO satellites in RR Article **21**.

Within the second method, there was no agreement on which additional FSS operational requirement(s) should be included.

Resolution 141 (WRC-03) – Sharing between certain types of non-geostationary-satellite systems in the fixed-satellite service and stations in the fixed service in the 17.7-19.7 GHz band

4/1.18/1 Issue A – Resolution **141 (WRC-03)** *invites ITU-R*

"1 to conduct, as a matter of urgency and in time for WRC-07, the appropriate technical studies to determine whether the current pfd limits for non-GSO systems in the FSS in Article **21** are adequate to protect the fixed service in the 17.7-19.7 GHz band from non-geostationary systems described in *considering g*) without unduly constraining the use of these non-GSO FSS systems"

* The Arab States request to be bound to the title of this agenda item which refers to special orbits called highly inclined orbits. The Arab States prefer to use this title everywhere in the CPM Report on this agenda item and not to be linked to non-GSO.

4/1.18/1.1 Background

Pfd limits applicable to all non-GSO FSS systems in the 17.7-19.3 GHz band were adopted at WRC-2000. These limits were calculated on the basis of sharing studies involving non-GSO, circular orbit, satellite systems of low-earth-orbit (LEO) and medium-earth-orbit (MEO) types and are included in RR Article **21**. The systems described in Resolution **141 (WRC-03)** *considering g)* are those "non-GSO satellite systems using HIO having an apogee altitude greater than 18 000 km and an orbital inclination between 35° and 145°".

4/1.18/1.2 Summary of technical and operational studies and relevant ITU-R Recommendations

4/1.18/1.2.1 Fixed service (FS) technical and operational characteristics

4/1.18/1.2.1.1 FS protection criteria

The aggregate FS protection criteria in the 17.7-19.3 GHz band are contained in Recommendation ITU-R F.1495 (I/N is defined at the input of the FS receiver):

Long-term: I/N should not exceed –10 dB for more than 20% of the time.
Short-term: I/N should not exceed +14 dB for more than 0.01% of the time.
I/N should not exceed +18 dB for more than 0.0003% of the time.

For purposes of the studies undertaken pursuant to Resolution **141 (WRC-03)**, it was agreed that the above protection criteria could also be applied to FS systems in the 19.3-19.7 GHz band.

4/1.18/1.2.1.2 Summary of technical FS parameters

FS system technical parameters used in technical sharing studies are summarized in Table 1.18-1 below.

TABLE 1.18-1

FS receiving station parameters

Elevation angle (degrees)	0, 2.2, 3, and 10*
Azimuth (degrees)	From 0° to 360° in steps of 1° or less in equal increments
Ground height above sea level (m)	0 or Recommendation ITU-R P.1511
Antenna radiation pattern	Recommendation ITU-R F.1245
Maximum gain (dBi)	32, 38 or 39, 48
Feeder loss (dB)	3
Thermal noise (dB(W/MHz))	–139
Atmospheric gaseous attenuation	Recommendations ITU-R SF.1395 and ITU-R P.676-6
Antenna height above ground (m)	13 m

* The majority of FS receivers in the 17.7-19.7 GHz band operate with elevation angles of between –3° and 3°. In some administrations, there is a non-negligible proportion of receivers (on the order of 2%) that have elevation angles above 5°.

4/1.18/1.2.1.3 Fixed service deployment: Infrastructure network

In many countries, the main FS use in the 17.7-19.7 GHz band is for infrastructure links to support mobile networks or other networks. In these countries the band is heavily used with the number of links increasing steadily. These infrastructure links are point-to-point links, and are generally short-range, low-elevation-angle links. In some countries, this band is also used for trunk networks between remote areas and for vessel transportation systems.

In actual FS stations, several sizes of antennas with different gains are used. The antenna utilization probability does not have equal distribution with respect to the elevation angles (see Table 1.18-2, which contains FS deployment statistics provided by Canada (CAN), Japan (J) and France (F)). In these countries FS links with high elevation angles are used in a rather smaller probability than FS links having a low elevation angle.

TABLE 1.18-2

Example of FS deployment statistics for FS receivers operating in the 18 GHz band

		Low angle path			Medium angle path			High angle path		
Elevation range		**< 1.5°**			**1.5-6.5°**	**1.5-5°**	**1.5-6°**	**>6.5°**	**>5°**	**>6°**
Administration		**CAN**	**J**	**F**	**CAN**	**J**	**F**	**CAN**	**J**	**F**
Total		94.7%	79.0%	89.45%	4.75%	17.0%	8.85%	0.55%	4.0%	1.7%
Antenna gain	32 dBi	0.17%	1.58%	35.3%	0.04%	3.23%	3.55%	0.04%	1.0%	0.75%
	38/39 dBi	52.06%	50.56%	39.6%	2.40%	13.26%	3.35%	0.44%	2.8%	0.65%
	48 dBi	42.47%	26.86%	14.55%	2.31%	0.51 %	1.95%	0.07%	0.2%	0.30%

4/1.18/1.2.2 FSS technical and operational characteristics

4/1.18/1.2.2.1 Summary of technical FSS parameters

The technical parameters of three FSS HIO systems filed with the ITU, as contained in Table 1.18-3, have been used in the studies. Operational characteristics described in § 4/1.18/1.2.2.2 have also been considered.

TABLE 1.18-3

Technical parameters of non-GSO FSS HIO Systems used in the studies

Satellite parameters	USCSID-P	N-SAT-HEO2	USAVKA-H1
Apogee altitude (km)	39 400	40 002.4	39 352
Perigee altitude (km)	1 000	31 569.6	1 111
Eccentricity	0.72	0.1	0.72
Inclination (degrees)	63.0	45.0	63.4
Argument of perigee (degrees)	270	270	270
Number of satellites/planes	8/8	3/3	3/3
Apogee longitude (degrees)		E 134.9	W 70
Right ascension of ascending node (degrees)	45, 90, 135, 180, 225, 270, 315, 360	205, 325, 85	0, 120, 240
Mean anomaly (degrees)	0, 135, 90, 225, 180, 315, 270, 45	120, 0, 240	0, 120, 240
True anomaly (degrees)		129.21, 0, 230.49	0, 165, 195
Minimum operational earth station elevation angle (degrees)	10	70	10
Minimum operational satellite altitude (km)	7 500	38 200	16 000
Maximum number of satellites providing service to a given area	1	1	1
Number of satellites in the system providing service to different areas	0	0	2
Satellite transmit antenna pattern roll-off	Rec. ITU-R S.672; $L_N^* = -20$ dB	Rec. ITU-R S.672; $L_N^* = -20$ dB	Rec. ITU-R S.672; $L_N^* = -25$ dB
Maximum satellite transmit antenna gain (G_m) (dBi) Antenna 3 dB beam width (degrees)	51 ~0.40	41 ~1.26	48 ~0.56
% active beams within satellite field-of-view	N/A	N/A	~4 %
Number of beams per satellite	1	1	22
Frequency reuse scheme	N/A	N/A	4 or greater
Satellite selection criterion	See Note 1	See Note 3	See Note 2
Required pfd (per satellite) (dB(W/m^2/MHz))	–111.5 at 90º –113.9 at 25º –114.6 at 15º –115.4 at 5º	–123 at 0º – 5º –123 + 0.65 (θ – 5) at 5º – 25º –110 at 25º – 90º	–115/–105 (depending on elevation angle)
Satellite bus power (kW)		~ up to 13	~10
Transmit power density at input to antenna (dBW/MHz)	at 7 500 km: –14 at 12 000 km: –11 at 20 000 km: –7.5	3	–4
Availability objective (%)	99.99	99.6	99.9

* L_N: near-in-side-lobe level relative to the peak gain.

NOTE 1 – The system USCSID-P chooses the satellite that is furthest away from the GSO arc, however it does not operate below 7 500 km altitude.

NOTE 2 – In general, the USAVKA-H1 system would select a satellite that provides the highest elevation angle. However, it would depend on the traffic demand and user distribution.

NOTE 3 – N-SAT-HEO2 consists of 3 satellites. Each satellite has its own orbital plane. One satellite in an active arc provides service. Another satellite will take over the service when the preceded one is at the end of its active arc.

4/1.18/1.2.2.2 Summary of operational FSS parameters

Non-GSO FSS systems are designed to provide effective Earth coverage to areas not sufficiently covered by GSO FSS systems or, depending upon the type of orbit used, provide service using lower power levels than those required for GSO FSS systems. Also, non-GSO systems using Molniya-like orbits allow high latitude earth coverage using high elevation angles for Earth terminals, reducing interference problems for high latitude countries using GSO service at low elevation angles. In the case of satellite systems using elliptical orbits meeting the criteria specified in *considering g)* of Resolution **141 (WRC-03)**), the satellite moves very slowly near the apogee of the orbit, which in most cases also corresponds to the period in which the satellite is active. This feature allows the satellite to remain for a quite considerable amount of time in the same portion of the sky, often called the active window, when seen from a point on the Earth.

It was agreed that only one satellite from each non-GSO FSS system of the type described in Resolution **141 (WRC-03)** – whether elliptical or circular in orbit – can make a meaningful interference contribution to any single FS receiving antenna on the Earth's surface, and that no more than three non-GSO FSS systems can operate on a co-frequency, co-coverage basis.

Some or all of the following operational characteristics of the HIO non-GSO FSS systems in the 17.7-19.7 GHz band have been taken into account in at least some of the studies:

1) All of the HIO non-GSO FSS systems described in Table 1.18-3 provide or plan to provide service through narrow spot beams. The typical 3 dB beamwidth of the satellite antennas is on the order of 1° or less.
2) Due to satellite weight/size/power constraints, identified HIO non-GSO FSS satellite systems in this band can operate with one or only a very small number of active beams at any instant, and thus satellite systems in this band can cover only a portion of the visible Earth at any instant, typically in a range from 5% to 10% of the satellite field-of-view.
   – Spacecraft lack the power to produce pfd levels at the –115/–105 dB(W/m^2/MHz) level simultaneously everywhere within the satellite field-of-view.
3) One proposed HIO non-GSO FSS satellite system with multiple beams plans to use a 4-times or a 7-times frequency reuse scheme meaning that any satellite beam will only use 1/4th or 1/7th of the bandwidth available to the satellite.
4) All of the existing and planned HIO systems in the 17.7-19.7 GHz band operate at minimum operational earth station elevation angles of 10º or more.

5) For HIO non-GSO FSS systems without power control, the pfd levels at an FS receiver when HIO non-GSO FSS satellites are near apogee may be lower than the levels when these satellites are at or near the minimum operational altitudes.

6) HIO non-GSO FSS satellites spend considerably more time at apogee (where they are moving slowly) than they do at or near the minimum operational altitudes (where they are moving very fast).

4/1.18/1.2.2.3 Fixed-satellite service deployment in the band 17.7-19.7 GHz

In some countries, segments of the 18 GHz band – e.g. 18.8-19.3 GHz – have been identified for use by high-density applications in the FSS, and there are plans to deploy HIO HDFSS systems in this band. It is also noted that there is one HIO system that uses the entire 17.7-19.7 GHz band.

4/1.18/1.2.2.4 Operational features and natures of the potential interference due to non-GSO FSS satellites using the orbit described in Resolution 141 (WRC-03)

HIO non-GSO FSS satellites spend considerably more time at apogee (where they are moving slowly). If an FS receive antenna is pointed towards an active HIO satellite at its apogee, and is in the main lobe of the satellite transmit beam, it may receive an unacceptable interfering signal depending on radiated power from the satellite for a significant amount of time. The duration and probability of interference varies with the type of orbit and the satellite switching method of the specific system.

4/1.18/1.2.3 Methodologies

4/1.18/1.2.3.1 Summary of methodologies on how to take the FSS interference into account

Several methodologies have been used to determine if the current pfd limits for non-GSO systems in the FSS in RR Article **21** are adequate to protect the FS in the 17.7-19.7 GHz band from non-GSO FSS systems using highly inclined orbits.

Assumptions of FSS characteristics and how they are modelled vary widely among the studies. In some studies, antenna roll-off was taken into account for all satellites. Differences in results reported arise mainly from differences in the use of statistics, differences in input data, and differences in the approach for interpretation of results.

4/1.18/1.2.3.2 Use of statistical power flux-density distribution

It is important for the studies conducted in response to Resolution **141 (WRC-03)**, to the extent that they show exceedances of the FS protection criteria, to include an assessment of the probability of the elevation angle/antenna combination from FS receivers. In this connection, some studies used methods of assessing this probability, and included either results based on statistical distributions, results based on examples or results based on actual FS deployment statistics reported to the ITU-R.

Among the approaches used in the studies, some administrations used the methodology included in Recommendation ITU-R SF.1602. This Recommendation recommends that the pfd distribution statistics may be used for frequency sharing studies between FS and multiple FSS satellites. Due to satellite weight/size/power constraints, HIO satellites in the 17.7-19.7 GHz band operate with a small number of active beams/channels at any instant. Recommendation ITU-R SF.1602 assumes that such systems operate at or near the pfd limit levels only for a small probability of occurrence.

Other administrations believe that the use of Recommendation ITU-R SF.1602 is not appropriate for application to interference studies concerning specifically HIO satellites.

4/1.18/1.2.3.3 Size of geographical distribution of FS receivers for interference evaluation

When the evaluation of interference is done in a statistical way, the size and location of the geographical area, over which the probability of exceeding the protection criteria is computed, greatly influences the results.

Some administrations note that as FS receivers are planned at country level and not on a global scale, probabilities computed over large portions of the globe may not reflect the actual probability for an FS operator in one specific country to experience excessive interference to its existing or planned FS links.

Other administrations note that probabilistic studies that include large areas must take into account the total geographic area of the FSS field-of-view, since the FSS beam covers a larger area and that the RR Article **21** pfd limits consider global FSS operations.

4/1.18/1.2.4 List of relevant ITU-R Recommendations and Reports

The list of ITU-R Recommendations considered when developing technical studies to satisfy this agenda item is as follows: Recommendations ITU-R F.1245, ITU-R F.1495, ITU-R P.676, ITU-R SF.1395, ITU-R SF.1483, ITU-R SF.1572, ITU-R SF.1602, ITU-R S.672, ITU-R S.1328, ITU-R S.1528, ITU-R P.1511, ITU-R S.1758, and Report ITU-R F.2060.

4/1.18/1.3 Analysis of results of studies

The first category of studies (§ 4/1.18/1.3.1) deals with studies showing that the RR Article **21** pfd limits on HIO FSS satellites adequately protect FS links in the 17.7-19.7 GHz band.

The second category of studies (§ 4/1.18/1.3.2) deals with studies showing that the RR Article **21** pfd limits on HIO FSS satellites do not adequately protect FS links in the same band**.** Therefore possible alternative pfd masks and their impact on the FS are also presented in this section.

The question of the constraints imposed by the RR Article **21** pfd limits and other considered pfd masks on the FSS is addressed in § 4/1.8/1.3.3 below.

4/1.18/1.3.1 Analysis of the studies showing that the RR Article 21 pfd limits on non-GSO FSS satellites using HIO adequately protect the FS in the 17.7-19.7 GHz band

Studies were conducted in the ITU-R to assess the potential interference from three HIO systems into a fixed service receiver. One study, taking into account the pfd distribution statistics called for in Recommendation ITU-R SF.1602 (see § 4/1.18/1.2.3.2 above) and the operational HIO FSS system parameters discussed in § 4/1.18/1.2.2.2, simulated the interference effects of three USAVKA-H1-type systems on 56 160 FS receiver cases around the world. The use of three USAVKA-H1 type systems – as opposed to one each of the three systems characterized in Table 1.18-3 – is significant, as this type of system has the greatest potential for causing interference to the FS of the three HIO type systems included in Table 1.18-3, and thus represents the worst case. In the study, at each of the FS locations, the parameters of Table 1.18-1 were used.

When the calculated interference levels were strictly based on maximum pfd anywhere within the satellite field-of-view, with each satellite producing the RR Article **21** pfd levels, the interference levels at an FS receiver exceeded the FS protection criteria for some azimuth and elevations. When these I/N levels were recomputed by taking satellite parameters, such as satellite power, number of active beams, etc. (as described in Recommendation ITU-R SF.1602) into account, the interference levels at an FS receiver did not exceed the FS protection criteria.

Another study used three USAVKA-H1 systems (a total of six simultaneously active satellites) and the FS system parameters and deployment statistics shown in Tables 1.18-1 and 1.18-2. The interference levels into FS receivers in three large geographical areas – North, Central and South American regions – from three constellations (six simultaneously active satellites) were calculated. Depending on which geographical area was studied, a range of 99 to 730 locations were examined. At each location, depending on the size of the FS antenna used in the simulation, there were 518 400 to 15 552 000 interference (I/N) samples calculated for each FS antenna/elevation angle combination. The calculated interference levels at FS receivers in North and Central America were based on the assumption that each USAVKA-H1 satellite produces pfd at −115/ −105 dB(W/m^2/MHz). The study indicated that due to high elevation angles of the HIO FSS satellites over most of the FS service area, the interference levels into FS receivers in North and Central America were well within the allowances provided for in each of the three FS protection criteria. In the case of South America, the calculated interference was based on a spot beam approach complying with the –115/–105 dB(W/m^2/MHz) levels; however, the satellite antenna roll-off in accordance with Recommendation ITU-R S.672-4 with maximum antenna gain G_m = 48 dBi and L_N = –25 dB (see Table 1.18-3) with the beam center located at 10° N – 60° W was taken into consideration. There was a small percentage of FS receivers, up to 0.06% in the case of long-term and ~ 0.000037% for short-term, where the overall I/N levels exceeded the FS protection criteria for the assumed FS antenna deployment.

Another study on the USAKVA-H1 system that used a random placement of fixed service sites in the northern and southern hemispheres showed that the probability of exceeding the long-term interference criteria is 0.5% or lower when FS deployment statistics were considered.

Of the three non-GSO FSS HIO systems currently filed with the ITU, the USCSID-P system is the one least likely to cause interference in excess of the FS protection criteria, even if operating at the current pfd limits, because of its particular orbital and operational characteristics. In fact, the Molniya-type HIO system orbital characteristics are such to create eight repetitive earth tracks, equally spaced in longitude with only one satellite describing each of them. As a consequence, the portion of the sky corresponding to the apogee is not constantly occupied by one satellite, as, when one satellite moves away, there is no other satellite to replace it. Instead, the link has to be switched to a satellite in one of the adjacent tracks with a significantly different azimuth and elevation angle, so that, in terms of impact on the FS, the FS antenna angular discrimination would reduce the amount of received interference. In summary, any satellite in the USCSID-P system is not likely to stay in the main beam of an FS receiver long enough to cause exceedance of the protection criteria.

It is significant to note that the USCSID-P system has been operating globally since 1995 and there have been no known instances of interference into the fixed services.

Another study based on all visible and active satellites of 12 N-SAT-HEO2 type systems (or 12 USAVKA-H1 type systems) and taking antenna roll-off into account, showed that the FS stations are adequately protected from the interference coming from all visible and active satellites. However, in this study, the beams were pointing towards the centre of the Earth therefore unlikely to cause interference at low elevation angles.

Another study used a pfd mask approach but also considered satellite antenna roll-off in accordance with a “ground swath approach” (where 6 HIO satellite active arcs covered the Earth with non-overlapping 60° wide (in longitude) service areas at the equator) and used the FS deployment statistics in the 17.7-19.7 GHz band in Canada, Japan and France. The study employed a combination of a pfd mask approach with the closest HIO satellite with spot beams from other HIO satellites (outside the service area of the closest HIO satellite) directed toward earth stations on the boundary of the service area of the closest satellite. Overall, when the FS deployment statistics are considered and the results obtained at each location in the simulation region are weighted, the probability that any of the three thresholds would be exceeded was at least an order of magnitude lower than the permissible level of exceedance. Of the results obtained for each antenna gain/elevation angle combination, only in the case of the highest gain (48 dBi) antenna at the highest elevation angle (10°) were the two short-term criteria (0.01% and 0.0003% for +14 dB and +18 dB *I*/*N* respectively) exceeded overall in the simulation region. When the FS deployment statistics in each case were considered, the overall probabilities that the short-term thresholds were exceeded for the entire population of FS receivers was well within acceptable limits.

In summary, the results of the studies described in this § 4/1.18/1.3.1 indicate that the interference-to-noise ratio levels, *I*/*N*, at FS receivers are below the FS long-term and short-term interference criteria when the FSS system parameters, such as number of beams, frequency reuse, and power flux density distribution are taken into account when computing the interference levels at an FS receiver. Based on the foregoing studies, the only conclusion to draw is that the current power flux-density levels in RR Table **21-4** in the band 17.7-19.7 GHz are adequate to protect FS systems operating in the 17.7-19.7 GHz band.

4/1.18/1.3.2 Analysis of the studies showing that the RR Article 21 pfd limits on non-GSO FSS satellites do not adequately protect the FS in the 17.7-19.7 GHz band

4/1.18/1.3.2.1 Analysis regarding the RR Article 21 pfd limits

The pfd mask was mainly used in these studies, in order to avoid consideration of all system specific operational characteristics. Spot beams were considered in some of the studies. While it was agreed that pfd levels at the –115/–105 dB(W/m^2/MHz) level would not be produced everywhere within the satellite field-of-view, the pfd levels at specific FS locations were considered, in order to test the adequacy of the pfd mask itself, and to identify the areas on Earth where potentially excessive interference can occur.

Mainly the characteristics of the USAVKA-H1 and N-SAT-HEO2 systems were taken into account in the technical studies. It is noted that N-SAT-HEO2 has already been filed with a tighter mask.

Studies showed that only when the angle of arrival of the interfering signal is high, as FS links are generally deployed with low elevation angles and the interference levels are minimized by the FS antenna characteristics at those angles (back or side lobes), the RR Article **21** pfd mask adequately protects FS links. However, for low angles of arrival, when the interference is received in the main lobe of the FS antenna and the satellite is near its apogee, and therefore moving very slowly in the sky, studies described in this section showed that when the RR Article **21** pfd mask is used, the FS protection criteria can be exceeded.

In particular, these studies showed that, considering even only one satellite in one active window of one system and assuming that the pfd levels at all angles of arrival in the field-of-view of the HIO FSS satellites were those of the RR Article **21**, either the long or short-term FS protection criteria, as defined in Recommendation ITU-R F.1495, can be exceeded. Specifically, there are potentially affected areas on the surface of the Earth, where the elevation angle to an active HIO satellite is low, in which the long-term FS protection criterion can be exceeded for an FS azimuth range of several degrees. Outside of the potentially affected areas, the FS protection criteria will not be exceeded. The azimuth range depends on the FS elevation angle and antenna gain. For instance, for a 32 dBi FS antenna gain, the azimuth range for which the long-term criterion can be exceeded varies between 7° at a FS antenna elevation of 0°, to 20° at an FS antenna elevation of 10°. Therefore, the probability for an FS receiver with a 32 dBi antenna gain to be affected by excessive interference in these areas will vary between 2% and 5.5%. Given the HIO orbital characteristics, the determination of such areas is straightforward: they are bands of several degrees in latitude that approximately follow the visibility contour line of the satellite, when at its apogee, for, at least, the longitude range corresponding to the satellite coverage area. FS receivers in these potentially affected areas, pointing in the azimuth direction corresponding to an active satellite near its apogee, are in the worst possible location in terms of potential interference, as the satellite can stay in their antenna main beam for a long time. The geographic extent of the potentially affected areas is not the only concern (1° of latitude corresponds to approximately 100 km at intermediate latitudes), but also the percentage of time for which the *I*/*N* criteria are exceeded in the potentially affected areas, which can be much larger than the long term protection criterion (20% of time).

Within the potentially affected areas, the long-term criterion is shown in the studies to be more frequently exceeded with the lower FS antenna gains, because of the broader antenna beams. The studies show that short-term protection criteria, when using the highest antenna gain of 48 dBi, would only be exceeded for smaller regions of the Earth's surface.

Considering the use of spot beams, the critical case in terms of interference occurs for low operational elevation angles. Specifically, for operational earth station elevation angles down to 10º, the worst FS receiver locations are not those in the immediate vicinity of an FSS HIO system earth station at 10°, as they would see the satellite at a still relatively high elevation. Assuming an FS elevation lower than 10°, the location where the FS receiver would receive the most interference corresponds to an area behind the FSS earth station, as the FS antenna will receive in its main beam, the main lobe effect of the satellite beam.

In two studies, the impact of individual beams of only one active satellite was evaluated. The beams were pointing at FSS earth stations at relatively low elevation (but always higher than the minimum elevation angle), as these represent the most critical cases. The e.i.r.p. for each beam was such to produce pfd levels always below those in the current mask for each elevation angle. The orbital characteristics of USAVKA-H1 system were used. Using only one beam for only one active satellite, and depending upon the location of the FS receiver, the long-term interference criterion can be exceeded for FS receivers in areas on the Earth of approximately 480 000 km^2, and for FS azimuth ranges of up to 7° in the direction of the satellite apogee. These results, obtained by taking into account the specific operational characteristics of one satellite system, such as satellite antenna gain, roll off characteristics, location of earth stations and satellite switching system, confirmed that the current pfd mask is such that FS receivers in specific areas of the Earth could suffer from interference at levels greater than the FS protection criteria, depending on azimuth, elevation angle, and antenna gain.

Using all visible satellites at the pfd mask levels, as well as one satellite per system at the pfd mask levels, some studies showed the probability of exceeding at least one criterion in Recommendation ITU-R F.1495 for FS stations evenly distributed over an area that includes most of the Northern Hemisphere to 10° S, using the pfd mask in RR Article **21** and the pfd mask alternative considered in § 4/1.18/1.3.3. The same studies were also made for Russian territory, taking FS deployment statistics into account, i.e. the percentage of FS receivers with elevation angles below 0°, between 0° and 2.2°, and above 2.2°. The results must be taken into account when estimating the impact on FS systems from HIO FSS systems. These studies show that the probability of exceedance is between 0.11% and 0.5%. However, due to the high latitudes involved, the Russian territory is mainly outside the potentially affected areas of the considered satellite systems.

In summary, the results of the studies described in this § 4/1.18/1.3.2 indicate that the interference-to-noise ratio levels, *I*/*N*, at FS receivers are above the FS long-term and short-term interference criteria considering the RR Article **21** pfd limits and the FSS system parameters, such as satellite antenna roll off, minimum operational elevation angle, minimum operational altitude and satellite switching technique are taken into account when computing the interference levels at an FS receiver. Based on these studies, the only conclusion to draw is that the current power flux-density levels in RR Table **21-4** in the band 17.7-19.7 are not adequate to protect FS systems operating in the 17.7-19.7 GHz band.

4/1.18/1.3.2.2 Analysis regarding alternative pfd masks

Studies using alternative pfd mask (Mask B presented in Table 1.18-4 below) were also conducted. They are based on the selection of one satellite, from each of up to three constellations.

The results of some studies also show that this mask does not fully protect FS systems. However, when taking into account the effect of FS deployment statistics as described in Table 1.18-2, it can be considered that the level of protection to FS systems provided by the Mask B is adequate.

Another study using a different alternative pfd (Mask C presented in Table 1.18-4 below), based on all visible and active satellites, showed that the long-term criterion would be exceeded for a small percentage, i.e. 0.7% (versus ~2% for the RR Article **21** pfd limits) of FS receivers but it is acceptable.

TABLE 1.18-4

Pfd masks considered in the study (dB(W/m^2) in 1 MHz)

	$0° \leq \theta \leq 5°$	$5° < \theta \leq 25°$	$25° < \theta \leq 90°$
Mask A (RR Article **21** mask)	–115	$-115 + 0.5 (\theta - 5)$	–105
Mask B	–123	$-123 + 0.65 (\theta - 5)$	–110
Mask C	–125	$-125 + 1.0 (\theta - 5)$	–105

4/1.18/1.3.3 Impact of the various pfd masks on the fixed-satellite service

The feasibility of a particular satellite to meet the pfd limits on non-GSO FSS systems in RR Table **21-4** in this band will be based on the design of the satellite system. Among others, the parameters of interest include frequency, the size of the service area, the angle of arrival of the bore sight of the satellite's main beam, the beamwidth of the satellite antenna and the receive earth station antenna, the number of co-frequency beams and satellite transmit power.

In general, a satellite system designer manipulates these parameters in order to meet design objectives and regulatory constraints, in this case pfd limits. In this regard, it has to be emphasized that the current pfd mask in RR Article **21** represents a constraint on the design and operation of HIO non-GSO FSS satellites and systems. Modification to the existing limits either at low or high elevation angles will further reduce the already small amount of flexibility that HIO systems need in order to meet operational objectives and also meet the constraints of the pfd limits.

Proposed HIO non-GSO FSS satellite systems, such as the USAVKA-H1 system, plan to provide service to users operating with small earth terminals. In order to simplify the design and thus minimize the system cost, particularly for applications of ultra/very small aperture terminals (USAT/VSAT), the users only need a single-axis tracking antenna instead of two-axis tracking antenna, if the 3 dB beamwidths of these antennas are broad enough to compensate for the out-of-plane pointing error. At the current pfd levels in RR Article **21**, the allocated fade margin for these types of applications is only 2.3 dB – a level that already does not provide a good link availability in the 18 GHz band. Any tightening of the limits and reduction in the already small fade margin would be difficult for HIO non-GSO FSS systems to accommodate.

During the studies, various alternative pfd masks were analyzed. Therefore, the impact of these masks on the design and operation of HIO non-GSO FSS systems was also studied including the RR Article **21** pfd mask (Mask A in Table 1.18-4 above). The results could be summarized as follows:

1) Mask A would not impose undue constraints on HIO satellite systems.
2) Masks B or C in Table 1.18-4 above, with their tightening of pfd at low elevation angles of arrival and/or high elevation angles of arrival, if applied to HIO non-GSO FSS satellite systems, would decrease the feasibility of using such systems that intend to provide greater than small-region coverage and/or operate with small earth terminal antennas.

Restrictions imposed by Masks B and C would preclude HIO systems from serving large coverage areas and small earth terminals (particularly for those HIO systems that use low elevation angles), while Mask B would be acceptable for HIO systems such as N-SAT-HEO2, which provide small-region coverage from multiple HIO satellites.

Results of other studies indicate that in order to meet Masks B and C, the USAVKA-H1 system would need:

1) to operate with bigger earth terminal antennas than the current design by at least a factor of 3;
2) to incorporate an expensive two-axis tracking antenna into its design; and/or
3) to increase the minimum operational elevation angle from 10° to 25° or higher. Raising the minimum elevation angle from 10° to 30° would reduce the service area for an HIO satellite by 37% (in all directions) and reduce earth terminal access time to the satellite by up to 60% of the time. Adding satellites to a HIO system to recover service area lost due to an increase in minimum earth station elevation angle could double system implementation costs and is an incomplete solution, since service area in southern latitudes cannot be recovered. Furthermore, using big earth terminal antennas, three times bigger than the baseline design, and requiring a two-axis tracking antenna are not acceptable for consumer/business applications, particularly for USAT/VSAT applications. This study concludes that Masks B and C will unduly constrain the FSS.

Under another study, the impact on the FSS of alternative pfd Mask B in Table 1.18-4 was studied by calculating resulting *C*/*N* ratio at different earth station locations for different angles of arrivals in the cases of a satellite at apogee and a satellite at minimum operational altitude. This study showed that *C*/*N* ratio calculated at earth station situated in the service area of the beam is always over 15 dB. This value can be considered to be sufficient and thus, the alternative pfd mask does not unduly constrain the FSS. However, the study was based on a 1.3 m earth terminal antenna. This implies that a two-axis tracking antenna is required. In addition, the path loss variation (~6.7 dB) and the atmospheric loss were not taken into account.

4/1.18/2 Issue B – Resolution **141 (WRC-03)** *invites ITU-R*

"2 to determine whether there are technical and operational measures in the band 17.7-19.7 GHz that could be implemented in the fixed service to mitigate interference from FSS space stations as described in *considering g)*"

4/1.18/2.1 Background

If the outcome of Issue A is that the existing pfd limits are adequate to protect the fixed service, there is no need to address Issue B. If the outcome of Issue A is that the existing pfd limits are not adequate to protect the fixed service, it would be necessary to address Issue B. Under the second approach, the mitigation techniques to be studied may include measures that could be implemented by FS links already deployed, as well as to future FS links.

4/1.18/2.2 Summary of technical and operational studies and analysis of results

The potential mitigation techniques described in Table 1.18-5 were considered. There were no detailed studies undertaken to determine any possible trade-offs should any of the identified mitigation techniques be implemented. It is agreed that it may be difficult or impractical for FS systems already deployed to implement the identified mitigation techniques. For future FS systems, these methods, in particular a), b), c) or e), could be applied with less significant burden on the FS operator. The applicability of particular mitigation techniques depends upon the HIO system filed in the ITU. Therefore, it could be possible in case-by-case basis approach to adopt a), b), c) or e), if such treatment is required in limited cases.

TABLE 1.18-5

Summary of consideration on the potential application of mitigation techniques for planned/future FS links

	Application to planned/future links
a) Change in orientation of the path	Additional resources may be needed to locate a new intermediate station, which could avoid the interfered-with direction
b) Attenuate the signal at the receiver and increase the transmitted power by a corresponding amount	Increasing the transmit power may cause consequential increase of interference to other FS receivers, thus lead to inefficient spectrum usage. In particular for systems using ATPC* process, this method is almost impossible. For FS systems not using ATPC, the method may be possible, with the domestic regulatory arrangement, to reduce the satellite interference level by the order of several dB
c) Change the FS antenna gain	Selection of the antenna size may be considered within infrastructure of the FS stations in conjunction with the transmit power. Use of a high gain antenna is advantageous for long-term interference as the narrower beam reduces the range of possible directions for the incoming interference. On the other hand, a low gain antenna will reduce short-term interference. The receiver level reduction due to the adoption of a lower gain antenna may be compensated by the transmitter power increase. As discussed in item b), this option is only conceivable in countries where ATPC is not implemented. Furthermore, a lower gain antenna has been shown to be worse in terms of long- term interference
d) Consider site shielding	This method does not seem effective or practical, since any shielding which could substantially reduce the interference may also prevent normal operation of the FS receiver
e) For high elevation angle paths, use a lower FS gain antenna	From the consideration for the existing link cases, it may be possible, in many cases, to use a lower gain antenna in high elevation angle paths. However, it should also be noted that a lower gain antenna may not mitigate against interference sources other than the HIO satellite. Also, see item c) above
f) Minimize the elevation angle of the FS antenna	A method to avoid a high elevation angle is achieved by locating an intermediate station with a medium height between the two existing stations. Additional resources may be needed to locate a new intermediate station, which could minimize the elevation angle. The site selection of an additional station to avoid a high elevation angle path is much more difficult than the case of changing the orientation in the horizontal plane. In addition, increasing the elevation angle helps to avoid the reflection of interfering signal on the ground from other sources

* ATPC: Automatic transmit power control.

4/1.18/3 Methods to satisfy the agenda item

4/1.18/3.1 Method A – No change to the current RR Article 21 mask

Under this method, there would be no change to the current pfd limits in the frequency range 17.7-19.7 GHz in Table **21-4** of RR Article **21**.

Advantages:

– No additional impact on the development and use of HIO non-GSO FSS systems in the 17.7-19.7 GHz band.

– No disparity created between HIO non-GSO FSS systems on the one hand, and other non-GSO FSS systems that would be subject to less restrictive limits on the other hand.

Disadvantage:

– Some administrations believe that this method does not adequately protect the FS, as the level of interference from HIO satellites to the FS receivers would be greater than under other methods.

4/1.18/3.2 Method B – No change to the current RR Article 21 mask but to mandate the implementation of the satellite antenna roll-off characteristics from Recommendation ITU-R S.672, and additional FSS operational requirements such as the specification of a minimum satellite transmit boresight elevation angle

Under this method, there would be no change to the current pfd limits in the frequency range 17.7-19.7 GHz in Table **21-4** of RR Article **21**.

Regulatory measures such as a new WRC Resolution would be developed to ensure adequate protection of the FS through FSS operational requirements such as a radiation pattern to be applied to the HIO satellite transmit antenna that would constrain the pfd only in specific directions, and a limitation on the minimum satellite transmit boresight elevation angle (i.e. the elevation angle at the boresight location on the ground to the satellite transmit antenna) that would have the effect of reducing the pfd received by FS receivers in potentially affected areas.

Advantages:

– Operational restrictions on HIO satellites will reduce the amount of interference to FS receivers from the interference that would be received under RR Article **21** pfd mask alone.

– Depending on the operational restriction(s) used in this method, the constraints imposed on the design and operation of HIO type non-GSO FSS systems may be manageable.

Disadvantages:

– Using an operational requirement to constrain the satellite pfd in specific directions may be difficult to implement in the RR, and may complicate RR Appendix **4** data required for satellite system advance publication/coordination/notification filings.

– There could be some impact on the design and operation of HIO type non-GSO FSS systems, depending on the operational restriction(s) used in this method.

4/1.18/3.3 Method C – To add a more stringent pfd mask applicable to HIO satellites at 17.7-19.7 GHz in RR Article 21

Under this Method, there would be a change to the RR Article **21** pfd limits in the 17.7-19.7 GHz band as shown in Table 1.18-6 for the HIO non-GSO FSS systems described in Resolution **141 (WRC-03)**.

TABLE 1.18-6

Proposed Mask for Method C (dB(W/m^2) in 1 MHz)

$0° \leq \theta \leq 5°$	$5° < \theta \leq 25°$	$25° < \theta \leq 90°$
–123	–123 + 0.65 (θ – 5)	–110

Advantage:

– This mask would adequately protect the FS.

Disadvantage:

– Some administrations believe that the pfd restrictions under this method would unduly constrain the design and operation of some HIO non-GSO FSS satellite systems.

4/1.18/4 Regulatory and procedural considerations

4/1.18/4.1 Method A

RR Article **21**, Table **21-4** can remain unchanged, and Resolution **141 (WRC-03)** can be suppressed. With the suppression of Resolution **141 (WRC-03)** as a consequence of this decision, there would be no need for the Radiocommunication Bureau to review, based on the values in RR Article **21** as adopted by WRC-07, any findings made on the compliance with the limits contained in RR Article **21** of a non-GSO FSS system, as described in *considering g)*, for which complete advance publication information has not been received prior to 5 July 2003. A note to this effect could be included for clarity's sake in the formal minutes of the WRC-07.

4/1.18/4.2 Method B

In this case, it would be necessary to adopt regulatory provisions that incorporate into the Radio Regulations the operational characteristics that are deemed necessary to adequately protect the FS at the current RR Article **21** pfd limit levels. For example, a resolution to address the operational restrictions developed pursuant to § 4/1.18/3.2 above could be developed.

An example text for such a draft Resolution is provided in Annex 1.18-1. An example of the footnote referring to the Resolution that could be added to the FSS (space-to-Earth) entries for the 17.7-19.7 GHz band in RR Table **21-4** follows:

ADD

21.16.x For non-GSO fixed-satellite service systems using highly-inclined orbits having an apogee altitude greater than 18 000 km and an orbital inclination between 35° and 145° in the band 17.7-19.7 GHz, the requirements in Resolution **[HEO Sat Antenna] (WRC-07)** shall apply.

With the suppression of Resolution **141 (WRC-03)** as a consequence of this decision, there would be no need for the Radiocommunication Bureau to review, based on the values in RR Article **21** as adopted by WRC-07, any findings made on the compliance with the limits contained in RR Article **21** of a non-GSO FSS system, as described in *considering g)*, for which complete advance publication information has not been received prior to 5 July 2003. A note to this effect could be included for clarity's sake in the formal minutes of the WRC-07.

4/1.18/4.3 Method C

The decision to add a new mask in RR Article **21** would lead to the following regulatory and procedural considerations:

– modify Table **21-4** in RR Article **21**, for the band 17.7-19.7 GHz, to include the new limits that apply to non-GSO FSS systems of the type described in *considering g)* of Resolution **141 (WRC-03)**;

– distinguish with footnotes between those non-GSO FSS systems to which the new limits would apply and all other types of non-GSO FSS systems (see revised RR Table **21-4** below);

– instruct the Radiocommunication Bureau to review, based on the values in RR Article **21** as adopted by WRC-07, any findings made on the compliance with the limits contained in RR Article **21** of a non-GSO FSS system, as described in *considering g)* in Resolution **141 (WRC-03)**, for which complete advance publication information has not been received prior to 5 July 2003;

– Suppress Resolution **141 (WRC-03)**.

Revision of RR Table **21-4** would be required as follows.

MOD

TABLE **21-4** (*continued*) **(WRC-~~03~~07)**

Frequency band	Service*	Limit in dB(W/m²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	**5°-25°**	**25°-90°**	
17.7-19.3 GHz [7, 8]	Fixed-satellite (space-to-Earth) (geostationary-satellite orbit) Fixed-satellite (space-to-Earth) (non-geostationary-satellite orbit) [20] Meteorological-satellite (space-to-Earth)	-115 [13] or $-115-X$ [12]	$-115 + 0.5(\delta - 5)$ [13] or $-115 - X + ((10+X)/20)(\delta - 5)$ [12]	-105 [13] or -105 [12]	1 MHz
17.7-19.3 GHz [7, 8]	Fixed-satellite (space-to-Earth) (non-geostationary-satellite orbit) [19]	-123	$-123 + 0.65(\delta - 5)$	-110	1 MHz
19.3-19.7 GHz	Fixed-satellite (space-to-Earth) (non-geostationary-satellite orbit) [19]	-123	$-123 + 0.65(\delta - 5)$	-110	1 MHz
19.3-19.7 GHz	Fixed-satellite (space-to-Earth) (geostationary-satellite orbit) Fixed-satellite (space-to-Earth) (non-geostationary-satellite orbit) [20]	-115	$-115 + 0.5(\delta - 5)$	-105	1 MHz
~~19.3-19.7 GHz~~ 22.55-23.55 GHz 24.45-24.75 GHz 25.25-27.5 GHz	Fixed-satellite (space-to-Earth) Earth exploration-satellite (space-to-Earth) Inter-satellite Space research (space-to-Earth)	-115	$-115 + 0.5(\delta - 5)$	-105	1 MHz

NOTE – The text for Nos. **21.16.1, 21.16.2, 21.16.17** and **21.16.18** (Notes 7, 8, 19, and 20) are not changed from the RR.

Annex 1.18-1

Example of a draft Resolution [HIO Sat Antenna] (WRC-07)

ADD

RESOLUTION [HIO SAT ANTENNA] (WRC-07)

Operational requirements for FSS satellite systems using highly-inclined orbits having an apogee altitude greater than 18 000 km and an orbital inclination between 35° and 145° in order to adequately protect the fixed service in the band 17.7-19.7 GHz

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the band 17.7-19.7 GHz is heavily used in many countries for the fixed service (FS) applications including mobile communication network infrastructure;

b) that in the band 17.7-19.7 GHz, there are two planned and one existing non-GSO fixed-satellite service (FSS) system using satellites with highly-inclined orbits having an apogee altitude greater than 18 000 km and an orbital inclination between 35° and 145°;

c) that in this frequency band, ITU-R has conducted studies of the impact on FS stations of the pfd produced or to be produced by non-GSO FSS systems of the type described in *considering b)*;

d) that a satellite antenna with appropriately designed radiation pattern, combined with a restriction on the minimum satellite transmit boresight elevation angle and the Article **21** pfd limits, for non-GSO FSS satellites of the type described in *considering b)* may adequately protect the FS,

resolves

1 that in the band 17.7-19.7 GHz, a satellite antenna used for non-GSO FSS satellites of the type described in *considering b)* shall meet the following radiation pattern, outside the coverage area:

$G(\psi) = G_m - 3(\psi/\psi_b)^{\alpha}$	dBi	for	$\psi_b \le \psi \le a\psi_b$
$G(\psi) = G_m + L_N + 20\log z$	dBi	for	$a\psi_b < \psi \le 0.5b\psi_b$
$G(\psi) = G_m + L_N$	dBi	for	$0.5b\psi_b < \psi \le b\psi_b$
$G(\psi) = X - 25\log\psi$	dBi	for	$b\psi_b < \psi \le Y$
$G(\psi) = L_F$	dBi	for	$Y < \psi \le 90°$
$G(\psi) = L_B$	dBi	for	$90° < \psi \le 180°$

where:

$$X = G_m + L_N + 25\log(b\psi_b) \quad \text{and} \quad Y = b\psi_b\, 10^{0.04(G_m + L_N - L_F)}$$

$G(\psi)$: gain at the angle ψ from the main beam direction (dBi)

G_m: maximum gain in the main lobe (dBi)

ψ_b: one-half the 3 dB beamwidth in the plane of interest (3 dB below G_m) (degrees)

a = $2.58\sqrt{(1-\log z)}$ and $b = 6.32$

α = 2

L_N = –20 (dB) (near-in-side-lobe level relative to the peak gain)

L_F = 0 dBi far side-lobe level

z: (major axis/minor axis) for the radiated beam

L_B: $15 + L_N + 0.25\ G_m + 5\log z$ dBi or 0 dBi whichever is higher.

2 that in the band 17.7-19.7 GHz, the satellite transmit antenna boresight elevation angle (i.e. the elevation angle at the boresight location on the ground to the satellite transmit antenna) for non-GSO FSS satellites of the type described in *considering b)* shall not be less than [*X*°];

3 that this Resolution shall not apply to systems of non-GSO FSS satellites of the type described in *considering b)* where there are less than three satellites having the same repeating ground track.

NOTE 1 – There would be a need to define the beamwidth ψ_b.

NOTE 2 – In *resolves* 2, in determining the value *X*, it should be taken into account that an increase in the minimum satellite transmit boresight elevation angle results in a consequential pfd reduction toward low angles of arrival that is greatest when the satellite is at apogee (i.e. where the satellite spends the greatest portion of its orbit time).

NOTE 3 – Some administrations are of the opinion that *resolves* 3 above should not be included in the Resolution.

Agenda item 1.19

"to consider the results of the ITU-R studies regarding spectrum requirement for global broadband satellite systems in order to identify possible global harmonized fixed-satellite service frequency bands for the use of Internet applications, and consider the appropriate regulatory/technical provisions, taking also into account No. 5.516B"

NOTE – There is no corresponding WRC Resolution for this agenda item.

Executive summary

The technology exists for any of the frequency bands below 30 GHz currently allocated to the fixed-satellite service (FSS) to be used for broadband internet access via satellite, and there is a variety of ways in which this may be achieved. In some existing satellites some of the capacity is already being used for internet access, and current technology permits the design and construction of satellites dedicated to the provision of broadband satellite access to multiple countries. The ITU-R has developed new Recommendations addressing the signalling protocol aspects of satellite internet access at high data-rates, and also a new Recommendation detailing the transmission characteristics of three possible examples of satellite systems suitable for this purpose and giving the substantial aggregate capacities they would provide. Additionally, another new Recommendation containing a database of characteristics of HDFSS systems has been prepared. For large scale provision of broadband internet access worldwide, frequency sharing problems are less likely to occur in the 20/30 GHz FSS allocations, which at present are relatively lightly used, than in the 4/6 GHz and 11/14 GHz allocations which are heavily used by existing FSS networks. Broadband Internet access is one of the applications for which the sub-bands within the 20/30 GHz allocations identified for high-density applications in the FSS (HDFSS) in RR No. **5.516B** would be suitable. A variety of existing systems already provide internet access for user terminals with antennas of diameter from 0.6 to 2.4 m, and these developments have occurred without the need for changes to the RR or the harmonization of system characteristics across the ITU Regions. The development of the new ITU-R Recommendations is considered to provide an adequate response to the studies required under Agenda item 1.19.

4/1.19/1 Background

It is well known that all FSS frequency bands, including those bands listed in RR No. **5.516B**, can be and in many cases are already being used for internet applications.

There are provisions in the current RR for coordination and notification of satellite networks which fully accommodate the ability of FSS systems to provide Internet access.

In addition, available ground segment equipment suitable for broadband/Internet applications is frequency agile and is fully capable of operating with the existing and planned FSS satellite systems in the allocated frequency bands. Furthermore, new satellite systems dedicated to broadband internet access will be able to operate in existing FSS bands without the need for changes to provisions in the RR. Concerns stem from the potential negative economic ramifications to satellite operators and the promotion of inefficient use of the radio-frequency spectrum and orbital resources, should frequency bands allocated to the FSS be restricted in the RR to the provision of specific types of FSS applications. Using applications in FSS bands can be done most efficiently when the potential user has maximum flexibility. Maximum flexibility can be exercised when implementing new or existing applications in FSS bands that are best suited to the application without regulatory impediments.

4/1.19/2 Summary of technical and operational studies, and relevant ITU-R Recommendations

4/1.19/2.1 Introduction and relevant ITU-R Recommendations

A review has been performed on the use of the FSS for the provision of broadband internet applications in FSS frequency bands. This review demonstrates that broadband internet applications can be accomplished by FSS systems under a wide variety of existing FSS allocations and consistent with the existing regulatory/technical provisions in the RR.

As regards ITU-R Recommendations, in order to overcome some of the problems associated with Internet Protocol (IP) transmission over satellite networks, such as signal delays and burst errors, ITU-R has developed methods and protocols for solving the problems in Recommendations ITU-R S.1709 and ITU-R S.1711. In addition, Recommendation ITU-R BO.1724 addressing "Interactive satellite broadcast systems" presents detailed information on satellite return channels for use with geostationary broadcasting systems that could be used for supporting internet applications.

Additionally, ITU-R has developed two new Recommendations: ITU-R S.1782 and ITU-R S.1783.

4/1.19/2.2 Harmonized bands

The major spectrum allocations for the FSS were made at WARC-71, and WARC-79. Additional global FSS allocations were made available at 40/50 GHz at subsequent Conferences. Most of these allocations were made on a global, i.e. all ITU Regions basis, and are currently being used by over 200 geostationary satellites. See also RR No. **5.516B** which identified frequency bands for use by HDFSS.

There has been solid development of the FSS during the years of availability of the worldwide FSS allocations, and the development is expected to continue.

4/1.19/2.3 Internet applications

There are many FSS satellites in orbit and their transponders are being used for a variety of services. In fact, a single satellite may be used for data, video, or telephony transmissions, depending on the demand in the particular part of the world it covers. Using a given satellite platform for a variety of services is often the most cost-effective way to implement a satellite system and provide service to the public.

One study has shown that the objective of providing broadband internet access to high-density, low-cost, portable user terminals may best be met by use of an FSS system designed to provide broadband internet access.

In order to achieve the potentially high space-sector capacity required for such systems, the satellites would need to include high-power transponders and employ frequency reuse using multiple spot beams. Although it is possible to design such systems to operate in a number of existing FSS bands, sharing problems may arise in frequency bands that are already heavily used for other applications. At frequencies such as those identified for use by HDFSS (see RR No. **5.516B**), it is easier to achieve narrow beams and the wavelength is consistent with very small antennas.

The FSS allocations have been available for over 35 years. As a consequence, cost-effective satellite technology has and will continue to evolve. Different size earth stations for different types of applications including internet applications have been used. In addition, during this time, as the applications using the FSS have developed and changed, changes to the Radio Regulations applicable to them have not been necessary.

Access to the internet using FSS satellite systems is currently being implemented in a number of ways, examples of which are illustrated in Table 1.19-1.

TABLE 1.19-1

Application	**Band**	**Typical terminal size**
Direct-to-business or residence	11/14 GHz 20/30 GHz	> 1.2 m 0.6 m
Bundled with other services	11/14 GHz 20/30 GHz	0.6-2.4 m 0.6 m
V-sat*/RLAN**	11/14 GHz	0.6-2.4 m

* Very small aperture terminal.

** Radio local area network.

Table 1.19-1 illustrates the variety of implementations taking place. Each requires its own standards, protocols and associated ITU-R Recommendations. It is apparent that these developments have taken place within the FSS bands which are not necessarily harmonized across the three ITU Regions.

As a result, at the moment the most cost-effective means of implementing internet by satellite in the most expeditious way is through the use of existing and planned FSS satellites such as those in the 4/6 GHz, 11/14 GHz and 20/30 GHz bands. Today's service providers often start their internet service using transponders (partial satellites) for economic reasons rather than incur the capital expense of a whole satellite. Furthermore, as commercially available ground equipment suitable for broadband/internet applications can be adapted to other bands, and as internet applications are being pursued in a wide range of FSS frequency bands at this time, it would be counterproductive to identify any subset of frequencies, especially for internet applications.

4/1.19/2.4 Satellite system functions for internet transmissions in digital networks with small aperture Earth stations (ES)

Creating a digital satellite communication network with small ESs is an effective method for providing access to information in any point on the Earth and bridging the so-called digital divide.

In a digital access network, satellites can be used at different connection sections for individual and community subscribers' direct access node, for content distribution, and for backbone links connecting node stations.

ITU-R has been working on the development of transport protocols supporting digital network operation with large values of signal delay, typical of satellite networks, and there are now methods and protocols for solving the problem (see Recommendations ITU-R S.1709 and ITU-R S.1711). The content distribution and connecting node functions can be fulfilled by the existing and planned FSS satellite networks within the framework of the existing orbit/frequency resources.

Most attention should be paid to the function of access to the network direct access node. The direct access node function can be performed via any FSS network providing for the use of small ESs.

The use of transmit/receive ESs with reduced antenna size may be possible when required, with one or more of the following techniques: a reduced signal-to-noise ratio, redistribution of link energy budget between uplink and downlink, higher *G/T*[*] satellites, and the use of wideband signals.

4/1.19/3 Analysis of the results of studies

Recommendation ITU-R S.1782 describes in some detail the coverage, up-link and down-link transmission parameters and payload arrangements of three types of satellite system that, based on current technology, would provide access to the internet at transmit and receive data rates of the

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* Antenna power gain-to-system noise temperature.

order of 2 Mbit/s. One type would provide direct satellite access via user terminals with 30 cm antennas, the second type would provide direct satellite access via earth stations with 1.2 m antennas, and the third type would be based on users being linked via local terrestrial radio networks to ‘community’ earth stations with a 2 m antenna, and thence via satellite to a central earth station for connection to the internet. In each case the system parameters are developed for 500 MHz bandwidths in the 11/14 GHz and 20/30 GHz FSS bands, and in one case also for the 40/50 GHz FSS bands. The capacity of each type of satellite system is calculated, and also the aggregate capacity that could be provided by multiple satellites of each type to a reference area of 10 million square kilometres on the Earth’s surface. It is evident that such systems could serve many users.

Since the first type of system outlined above, and possibly also the second type, would be an example of a high density application in the fixed-satellite service (HDFSS), Recommendation ITU-R S.1783 is also germane to the present studies. This Recommendation aims to meet the need within ITU-R for a common understanding of the types of system that are embraced by the acronym HDFSS. Annex 1 to this Recommendation contains an EXCEL spreadsheet commencing with an example system listing the main satellite, earth station and carrier parameters, and the performance objectives and interference levels for which the system was designed. Additionally, the characteristics of three different types of currently planned HDFSS applications are included, comprising a total of 58 links with different carriers and/or different combinations of transmit and receive earth station antenna size. These characteristics were provided by FSS operators, and the aim is for the characteristics of further HDFSS systems, including (but not limited to) systems providing broadband internet access, to be added in the same way in future.

There are many existing and planned systems in a number of different FSS frequency bands fully capable of providing broadband/internet applications on a global basis.

4/1.19/4 Methods to satisfy the Agenda item

The responses to the studies requested in Agenda item 1.19 have been provided in Recommendations ITU-R S.1782 and ITU-R S.1783. The identification of specific FSS frequency bands for internet applications will not improve, nor will it facilitate the provision of these applications.

4/1.19/5 Regulatory and procedural considerations

Internet applications are being developed and implemented today in the 4/6 GHz, 11/14 GHz and 20/30 GHz FSS allocations, without the need for any changes to the RR for specific applications. It is expected that this use of the bands will continue to grow and will accelerate as requirements are defined, and also that new satellite systems dedicated to broadband internet access could evolve in existing FSS allocations.

CHAPTER 5

SERVICES IN LF, MF AND HF BANDS AND MARITIME MOBILE SERVICE

(Agenda items 1.13, 1.14, 1.15 and 1.16)

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Agenda item 1.13*

"taking into account Resolutions 729 (WRC-97), 351 (WRC-03) and 544 (WRC-03), to review the allocations to all services in the HF bands between 4 MHz and 10 MHz, excluding those allocations to services in the frequency range 7 000-7 200 kHz and those bands whose allotment plans are in Appendices 25, 26 and 27 and whose channelling arrangements are in Appendix 17, taking account of the impact of new modulation techniques, adaptive control techniques and the spectrum requirements for HF broadcasting"

Executive summary of the Agenda item

The responsibility to develop CPM text for each associated Resolution was distributed to SG 6, and Working Parties 6E, 8A, 8B and 9C. No single Working Party was assigned a primary responsibility for the overall development of the CPM text. No specific tasks or responsibility were assigned to individual Working Parties with regards to Issue E. The elements of CPM text are summarized below in the order they are presented in the CPM text.

Resolution **729 (WRC-97) (Issues A and B)**: This Resolution calls for a review of frequency adaptive techniques for fixed and mobile services in the MF and HF bands. Two separate issues are addressed in the CPM text as Issues A and B (*resolves* 2 and 3 respectively). Issue A addresses the need to automatically limit simultaneous use of frequencies to the minimum necessary. Issue B addresses the need to evaluate the channel occupancy prior to and during operation, with a view to avoiding unintentional harmful interference.

Resolution **351 (WRC-03) (Issue C)**: This Resolution calls for a review of the frequency and channel arrangements for the maritime mobile service in the MF and HF bands. Particularly, this review addresses RR Appendix **17** with a view to improving efficiency by considering the use of new digital technology by the maritime mobile service.

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* The Administrations of Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Mauritania, Qatar, Syrian Arab Republic and Tunisia <u>object</u> to any regulatory proposal relevant to Agenda item 1.13 if it is proposed to modify RR Appendix **17** which is not allowed by Agenda item 1.13. Referring to Resolution **351 (WRC-03)** to justify such proposal is in contradiction with the text of this Resolution, which states that the results of ITU-R studies regarding RR Appendix **17** may be provided to a future WRC – by definition, this excludes WRC-07, with possible exclusion of WRC-11, unless WRC-07 considers studies are completed and that WRC-11 agenda items include the revision of RR Appendix **17**.

Resolution **544 (WRC-03) (Issue D)**: This Resolution addresses the identification of additional spectrum for the broadcasting service in the HF bands. It specifically notes a spectrum deficiency of at least 250 kHz, up to 800 kHz, for the broadcasting service in bands below 10 MHz.

Review of allocations **(Issue E)**: The task for this issue is to review the allocations to all services in the frequency range 4-10 MHz, except those that are excluded, with a view to address those issues outside of Resolutions **729 (WRC-97)**, **351 (WRC-03)** and **544 (WRC-03)** and those elements where the Resolutions are interrelated. There is a difference of opinion on the scope of this issue.

Summary of the Methods to satisfy the agenda item

There are eight Methods presented in the CPM text to satisfy specific parts of the agenda item. Although this may appear excessive, each method responds in part or in all to specific Resolutions of the agenda item or the overall review of the agenda item itself. Multiple Methods will need to be considered to resolve Agenda item 1.13. The number is due to the multiple Resolutions and the complexity of the many issues in this agenda item.

Method 1 (Issues A and B) **–** Addresses Resolution **729 (WRC-97)**. The working parties involved were able to converge on a single Method which proposes that no change to the Table of Frequency Allocations is required to satisfy Resolution **729 (WRC-97)** and lists no disadvantage to accepting this Method.

Method 2 (Issue C) **–** Addresses Resolution **351 (WRC-03).** The working parties involved were able to converge on a single Method which proposes revision of RR Appendix **17** to enable the use of new technology by the maritime mobile service and lists no disadvantage to accepting this Method.

Method 3 and 4 (Issue D) **–** These Methods address Resolution **544 (WRC-03)** and present the opposing views for this part of the agenda item. Method 3 presents an additional allocation of 250-800 kHz to the broadcasting service and also presents two illustrative examples of an allocation of 350 kHz. Specific advantages and disadvantages are provided. The regulatory considerations contain two different opinions about sharing between the broadcasting and fixed/mobile services on a co-primary basis: one without provisions imposing sharing conditions and another imposing such conditions. Method 4 presents no additional allocation to the broadcasting service and provides specific advantages and disadvantages.

Method 5 (Issue E) **–** This Method has two aspects, which address the general review of allocations and can also serve to offset the loss of spectrum to the affected services under Method 3. The first aspect proposes broader allocations by combining fixed and mobile service allocations (per Recommendation **34 (WRC-03)**). The second aspect addresses compensation to the fixed and land mobile service by providing limited sharing with the maritime mobile service. The Method provides specific advantages and disadvantages. The regulatory considerations contain two different opinions about sharing between the broadcasting and fixed/mobile services on a co-primary basis: one without provisions imposing sharing conditions and another imposing such conditions.

Method 6 (Issue E) **–** Under the general review of allocations, this Method provides a worldwide secondary allocation to the amateur service of 150 kHz at 5 260-5 410 kHz to allow communications at times when propagation conditions do not permit the use of the presently allocated bands at 3.5 and 7 MHz. The Method provides specific advantages and disadvantages.

Method 7 (Issue E) **–** A worldwide amateur allocation of 300 kHz was not achieved at WRC-03. Under the general review of allocations this Method provides a primary allocation at 7 200-7 300 kHz in Regions 1 and 3 to globally harmonize the amateur service allocations. The Method provides specific advantages and disadvantages.

Method 8 (Issue E) **–** Addresses the general review of allocations and presents no additional allocation for any service and no additional co-service sharing in the band 4-10 MHz. The Method provides specific advantages and disadvantages.

Introduction

The aim of WRC-07 Agenda item 1.13 is to consider service allocations in the HF bands in order to meet changing demands and patterns of use. This agenda item was recommended by WRC-03 following its studies on the impact of new technology in the maritime MF and HF bands, the realignment of bands round 7 MHz and the broadcasting spectrum between 4 and 10 MHz.

WRC-03 developed Resolutions **351 (WRC-03)** and **544 (WRC-03)** to give direction to the studies and preparations for WRC-07 on the future spectrum needs of the maritime mobile and broadcasting services, supplemented by the continuation of studies for the use of frequency adaptive systems in the MF and HF bands under Resolution **729 (WRC-97)**.

The issues involved are difficult to resolve. Most of the services using the HF bands have reported operational difficulties as a result of congestion. There are conflicting views on future spectrum requirements from the main users of the HF spectrum.

The fixed, land mobile, maritime mobile, amateur and broadcasting services have all noted the importance of maintaining continued access to adequate spectrum to support their current level of service. All services support the possibilities offered by both digital modulation and adaptive control techniques that are expected to lead to a renewed interest in making more intensive use of the HF bands.

Existing application of frequencies

HF systems support broadcasting, fixed, amateur, land, maritime and aeronautical mobile applications, which have primary or co-primary allocations in the bands between 4 and 10 MHz. These services value the use of this portion of the HF bands because of its unique propagation characteristics.

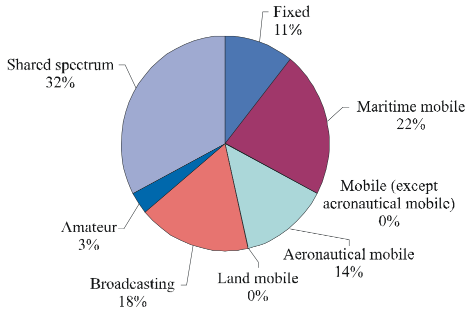
The long-range coverage depends on the refractive impact that ionized layers in the atmosphere have on electromagnetic radiation at HF. Instead of going “line-of-sight” out of the atmosphere and into space, the radiation is bent back to the Earth so that reception is possible hundreds or thousands of kilometres away from the transmission site. Some of the energy reflects off the ground, travels back to the ionosphere and returns to Earth farther away leading to reception possibilities at even longer ranges. Shorter range (a few hundred km) (NVIS) condition depends again on the ionosphere, but this time through reflecting the radiation from the various ionized layers at near vertical angles.

The choice of which frequency to use depends on factors including sunspot number, time of day, season of the year, latitude of transmission and reception, and elimination of interference with other users.

HF communications can support critical functions like public information, humanitarian relief aid and disaster mitigation. The attributes of HF communications make it an ideal solution for requirements that depend on communications over long distances without the need for relays. All of the services (fixed, mobile, broadcasting and amateur) play an important role in public protection and disaster relief.

Chart 1 and Chart 2 show the bands allocated to the various services in the 4-10 MHz part of the spectrum from 30 March 2009. Chart 1 shows the percentage of spectrum allocated on an exclusive basis to each service and the spectrum allocated to services on a shared basis in the 4-10 MHz range, whilst Chart 2 shows the percentage of this shared spectrum allocated to each service on a co-primary basis.

It should be noted that this shows the situation in Region 1 only and that there are differences in the other 2 Regions. It should also be noted that allocations on a secondary basis to some services either by footnote or within the Table of Frequency Allocations in RR Article **5** have been excluded to simplify the Charts.



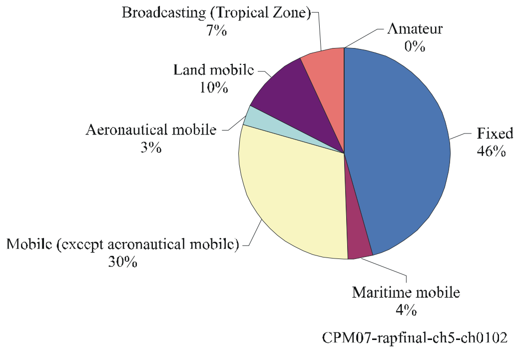


CHART 1

Allocations on an exclusive and shared basis in Region 1

CHART 2

Allocations on a co-primary basis in the shared spectrum in Region 1

Resolution 729 (WRC-97) – Use of frequency adaptive systems in the MF and HF bands

invites ITU-R

“1 to pursue its studies on the subject (see, for example, Questions ITU-R 204-1/1, ITU-R 147-1/9, ITU-R 205/9 or ITU-R 214/9) with a view to achieving optimum operational performance and compatibility”

NOTE – In order to carry out these studies, *resolves* 2 and 3 need to be taken into account.

5/1.13/1 **Issue A –** Resolution **729 (WRC-97)** *resolves*

“2 that frequency adaptive systems shall automatically limit simultaneous use of frequencies to the minimum necessary for communication requirements”

5/1.13/1.1 Background

At least two main approaches of spectrum usage exist on HF: traditional non-adaptive and adaptive systems, which can make use of various techniques for dynamic frequency selection, channel monitoring and sounding to implement real time spectrum management.

Since WARC-92, there has been rapid progress on the use of adaptive control techniques and sharing in the bands below 28 MHz (Ref. Recommendation ITU-R SM.1266). Adaptive systems were foreseen as being ideal for sending short burst packet data transmissions, so that channels can be released for other potential users as soon as possible thereby increasing the scope for inter and intra-service sharing.

The regulatory changes and modified notification procedures introduced at WRC-95 and WRC-97 gave full recognition to frequency agile systems. These developments were in part prompted by the effects of Resolution **23 (WRC-95)**[*] which brought to an end the examination of frequency assignments in the bands below 28 MHz. The effect was that the Bureau ceased to examine or apply the provisions related to the probability of harmful interference. The MIFR has not been steadily updated since 1995 and the entries do not represent actual usage. Since that time there have been no checks as to whether a proposed assignment may cause interference and be able to operate without interference. Administrations keep track of their own assignments and coordinate with other Administrations as necessary.

There are several adaptive techniques in use today, some of which are applied in specific situations. A major advantage of frequency adaptive systems is the ability to minimize the need for manual establishment of HF radio channels. Automatic Link Establishment (ALE) is a common technique. Typically, ALE systems are characterized by sequential polling of several frequencies (typically seven or more) that are assigned to a station to determine if ionospheric circuits are available at these frequencies. A network of stations is assigned a number of frequencies over which to communicate, and each station is assigned a unique address (e.g. alpha-numeric). The equipment automatically selects the best available channel by maintaining in real time a data base of link performance (e.g. received signal-to-noise power ratio) versus frequency for each addressee in the users net and using that data to choose frequencies on which to initiate a link.

5/1.13/1.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

Relevant Recommendations, Reports and Handbooks: ITU-R F.240-7, ITU-R F.339-7, ITU-R F.1110-3, ITU-R F. 1761, ITU-R F.1762, ITU-R SM 1266, ITU-R F.1778, ITU-R M.[8A/LMS.CHAR.HF] (Document 8/BL/37), ITU-R Report F.2061, ITU-R Report F.2062, ITU-R Report F.2087, ITU-R Report M.2080, ITU-R Report M.2085, ITU-R Handbook – Frequency Adaptive Systems.

Adaptive systems are rapidly replacing non-automated HF communication systems in the fixed and mobile services. Dynamic frequency sharing and real-time frequency management techniques are recognized as essential for more effective use of the radio spectrum, by providing communication circuits that are not otherwise possible because of interference constraints.

With frequency agile radiocommunication system there is a greater chance of maintaining successful communications provided sufficient frequencies are available. It is specifically true for systems providing long-range communication in West-to-East or East-to-West directions.

[*] Abrogated by WRC-2000.

The dynamic frequency management techniques have become valuable as a tool for avoiding being tied to unsatisfactory frequency options. This is especially important for those countries, which would previously have relied on advice from the Bureau when planning HF services. In the long-term, the use of frequency adaptive techniques will serve to overcome the difficulties imposed by a fixed band allocation structure under variable propagation conditions and therefore allow the available spectrum to be used to better effect than at present. Comprehensive guidance on the frequency adaptive systems is given in the Handbook on – Frequency Adaptive Communication Systems and Networks in the MF/HF bands.

In certain circumstances adaptive systems may not have the ability to provide effective links. If interference prevents communications on frequencies that a system would otherwise determine to be the best available channels, the user will not realize that interference is the cause. This is important when considering sharing between fixed or mobile service and other services.

Such circumstances may arise when all stations of a system operate in similar propagation environments or when a system is divided into subsystems employing different (daytime and night) groups of frequency allotments. Another problematic situation can arise for long-range systems using multi-hop techniques when it becomes necessary in a number of cases to employ increased power level to establish communication between stations in sunlit and in dark sides of the Earth.

In respect of the future trends, the following have been noted:

– the use and demand for HF spectrum for fixed and mobile applications is increasing rapidly;
– with the advent of new, higher speed HF modems, ALE equipment and bonding using several channels to enlarge bandwidth to increase capacity, HF e-mail is increasing in demand as it is cost competitive with satellite communications.

The convergence in digital HF communications (data, voice, sound and image) is giving rise to technology trends that are rapid and unpredictable. Administrations face spectrum planning challenges to deal with this convergence.

5/1.13/1.3 Analysis of the results of studies

Since WRC-03, Recommendations and Reports were produced addressing Resolution **729 (WRC-97)**. Work is continuing on technical parameters of adaptive systems. The development and deployment of dynamic frequency selection techniques in the fixed and mobile services has progressed rapidly.

The lower HF bands are ideal for short- and medium-range coverage (up to 2 000 km) during daytime and are also needed to support longer-range services at night. Propagation conditions decisively influence the availability and reliability of HF links.

Several different segments of spectrum are allocated to each radio service so that users of any service can have access to frequencies that are usable 24h. This will allow communications to maintain access to a suitable frequency irrespective of the conditions in the ionosphere. HF stations or HF circuits, including those kept in a silent mode or on watch, require a full set of frequencies ready for the time when circumstances demand their use.

No apparent changes are required to the procedures of the RR for the full implementation of adaptive HF systems. However, some advanced HF systems (e.g. file transfer, electronic messaging, and Internet) do require larger bandwidths than those commonly used at this time. This issue requires further study to determine how best it could be implemented.

The studies have also exposed some difficulties when multi-hop techniques are used for long-range communication links. The reliability and choice of operating frequency is influenced by the number of hops. Variability and absorption over the path increase with each reflection. The result is that the usable frequency range narrows with each successive hop, as the operational frequency range is compressed between the lowest maximum usable frequency and the highest lowest usable frequency along the path. Even when a frequency can be found which will propagate over the complete path it will often be necessary to employ increased power level to overcome the increased absorption losses. This is often the case when communicating between sunlit and dark sides of the Earth.

A system with long-range links generally needs more frequency assignments as compared with the number of stations in an ALE system. When a large number of stations in a network require concurrent transmission a situation could occur when some stations have to wait in a queue to result in reduction of promptness in data transfer. In some cases (e.g. for systems providing communication in extreme situations in inaccessible or distant areas) it would be unacceptable.

5/1.13/2 **Issue B –** Resolution **729 (WRC-97)** *resolves*

"3 that with a view to avoiding harmful interference, the system should evaluate the channel occupancy prior to and during operation"

5/1.13/2.1 Background

Adaptive HF systems manage call setup and call progress using digital data formats with embedded network and station addresses. Such systems have been in operation for over 20 years in some administrations where they are becoming the primary means of communications.

An essential feature of adaptive systems as required by *resolves* 3 of Resolution **729 (WRC-97)** is that their channel access protocols should operate such as to avoid interference between adaptive systems as well as other systems.

Improvements in HF technology have increased the importance of HF communications for a variety of users. Having a choice among multiple frequencies allows the system the flexibility to identify the optimum frequency while recognizing there are inherent propagation changes that continually affect the qualities and usefulness of each frequency.

5/1.13/2.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

Relevant Recommendations, Reports and Handbooks: See list under § 5/1.13/1.1.

Real-time channel evaluation is used in adaptive systems to test the quality of a circuit over a set of frequencies. This provides the means to match current propagation conditions by automatically selecting a frequency and simultaneously indicating standby channels. The simplest strategy would be to choose as the best frequency the one which maximizes the ratio of signal-to-background-noise-plus interference. However, the optimization of one circuit may give rise to interference on another.

Adaptive HF system has the ability to sense its communication environment and automatically adjust operations to improve performance.

These techniques increase the probability of establishing a successful communications link. An adaptive system’s capability to evaluate channel occupancy does not assure systems can coexist in the same frequency bands. When congestion is too great, adaptive systems may fail to provide the required quality of service.

5/1.13/2.3 Analysis of the results of studies

The analysis raised no additional issues to those noted in § 5/1.13/1.3 (Issue A).

Resolution 351 (WRC-03) – Review of the frequency and channel arrangements in the MF and HF bands allocated to the maritime mobile service with a view to improving efficiency by considering the use of new digital technology by the maritime mobile service

5/1.13/3 Issue C Resolution 351 (WRC-03) *invites ITU-R*

“to finalize studies currently ongoing:

– to identify future requirements of the MMS;

– to identify the technical characteristics necessary to facilitate use of digital systems in the MF and HF bands allocated to the MMS, taking into account any relevant ITU-R Recommendations;

– to identify the digital system(s) to be used in the MF/HF bands by the MMS;

– to identify any necessary modifications to the frequency table contained within Appendix **17**;

– to propose a timetable for the introduction of new digital technologies and any consequential changes to Appendix **17**;

– to recommend how digital technologies can be introduced while ensuring compliance with distress and safety requirements”

in accordance with *resolves* 2 of Resolution **351 (WRC-03)**.

5/1.13/3.1 Background

The future spectrum needs of the maritime mobile service in the HF bands are closely related to the introduction of new data exchange technologies into the maritime mobile service as an alternative standard for narrow-band direct printing (NBDP). The use of NBDP is in rapid decline. IMO has noted NBDP is currently used for broadcasting of MSI, ship reporting, weather forecasts and for business communications, e.g., by fishing fleets. All these functions could be provided by alternative data communications technology.

There is scope within the maritime mobile service for improving the utility of the present spectrum by allowing data transmissions to use certain parts of RR Appendix **17** currently designated for use by analogue voice channels to provide additional flexibility within the maritime mobile spectrum for data exchange services.

GMDSS compliance needs to be addressed before the NBDP requirement could be removed completely. NBDP remains useful for distress communications in the polar regions (sea area A4) when other terrestrial means of communication are no longer reliable, and there is no coverage from geostationary satellites. This functionality could be preserved using the HF distress and safety frequencies.

5/1.13/3.2 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant Recommendations and Reports: Draft new Recommendation ITU-R M.[HF-DATA] (Doc. 8/161(Rev.1)), Report ITU-R M.2082.

At the request of IMO ITU has developed a Recommendation describing the technical characteristics of data exchange systems, taking into account the harmonization of such systems.

5/1.13/3.3 Analysis of the results of studies

The safety nature of the maritime mobile service and the increasing demand for maritime MF/HF spectrum require a review of the digital techniques for the MF/HF bands. Recommendations on the characteristics of these digital systems and a review of RR Appendix **17** must be accomplished.

The new data exchange systems offer many advantages over NBDP. They make more intensive use of the spectrum, including analogue voice channels. This makes it necessary to review the current organization within RR Appendix **17**.

Due to the more robust propagation of NBDP compared to voice, NBDP cannot immediately be discontinued in A4 as a distress follow-up communication.

An HF system able to transmit data is necessary for the dissemination of MSI (Maritime Safety Information) as well as for transmission of observations and position reports from ships in sea area A4. This can be done by NBDP but also some new HF data exchange systems have this capability. Such data exchange systems are already in global use and further development is expected. These systems make use of the NBDP frequencies in RR Appendix **17** with the exception of distress frequencies.

IMO identified that there was inadequate spectrum for the requirements of the new digital data systems. IMO has endorsed the need to make better provision for data traffic in the maritime HF bands presently designated for telephony. The radiotelephony channels are used for data around the world.

Draft new Recommendation ITU-R M.[HF-DATA] (Document 8/161(Rev.1)) on Characteristics of HF radio equipment for the exchange of digital data and electronic mail in the maritime mobile service describes MF/HF radio systems and HF data transfer protocols currently used in the maritime mobile service for the exchange of data and electronic mail on frequencies of RR Appendix **17** and non-Appendix **17** frequencies, providing a similar functional capability to narrow-band direct printing (NBDP) and many other features. This Recommendation describes a method of providing completely transparent user interoperability in the transmission and reception of data to and from ships using HF while ensuring compliance with Chapter **VII** of the Radio Regulations. System interoperability can be achieved for the transmission of data messages in both the ship-to-shore and shore-to ship direction at the Internet protocol (IP) level.

The proposed modifications to RR Appendix **17** to accommodate new HF data services in ITU-R Report M.2082 are aimed at providing for 3 kHz bandwidth channelized duplex frequencies, wider bandwidths in both duplex and simplex, and bandwidths narrower than 3 kHz. Implementation of the proposed modifications will not disrupt safety and distress communications in the MF and HF bands. Consideration for the protection of the Global Maritime Distress and Safety System (GMDSS) and Maritime Safety Information (MSI) frequencies are included. NBDP frequencies for area A4, adequate frequencies for residual analog voice services, and original channel numbers have been retained as well. These proposed changes to RR Appendix **17** to accommodate new digital technology will not affect the future use of these frequencies or the capabilities of systems or new applications required for use by the MMS.

5/1.13/4 **Issue D –** Resolution **351 (WRC-03)** *resolves to invite ITU-R*

"1 to carry out studies on this matter, particularly in respect to the bands identified in the noting, taking into account technical, operational, economic and other relevant factors, including the appropriate transitional arrangements, and how the introduction of digital emissions will affect the HF broadcasting requirements and how such reallocations will affect other services using these bands"

Resolution 544 (WRC-03) – Identification of additional spectrum for the broadcasting service in the HF bands

5/1.13/4.1 Background

Resolution **544 (WRC-03)** notes a spectrum deficiency of at least 250 kHz and up to 800 kHz for the BS in the bands below 10 MHz. It also notes that WRC-07's agenda includes a review of allocations to the services in the HF bands between 4 and 10 MHz.

Specific preferred bands identified in Resolution **544 (WRC-03)** are 4 500-4 650 kHz, 5 060-5 250 kHz, 5 840-5 900 kHz, 7 350-7 650 kHz, 9 290-9 400 kHz and 9 900-9 940 kHz, but that any other bands between 4 and 10 MHz may be considered for allocation to the BS.

5/1.13/4.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

Relevant ITU-R Recommendations and Reports: ITU-R BS.1514-1, ITU-R BS.1615, ITU-R BS.705-1, RR Appendix **11** (Rev.WRC-03) – System specifications for double-sideband (DSB), single-sideband (SSB) and digitally modulated emissions in the HF broadcasting service, PDN Report ITU-R BS.[Information Relating to the HF Broadcasting Service] (Document 6E/357, Annex 6), ITU-R BT.1774.

The seasonal planning of the frequency bands allocated to the broadcasting service for HF broadcasting (HFBC) between 5 900 kHz and 26 100 kHz is based on a coordination procedure given in RR Article **12**. Taking into account the actual operating schedule, after coordination has been completed, there are still "collisions" where broadcasting emissions will receive interference from other broadcasting stations. Some administrations allow broadcasters utilization of RR Article **4.4** to use frequencies outside the bands presently allocated to the broadcasting service. This has become a practice for attempting to fulfil broadcasting requirements.

The operational schedule created by the coordination procedure includes broadcasting requirements in the HF bands between 3 000 kHz and 30 000 kHz but does not include all requirements for all countries.

Comprehensive studies have been carried out since 2001 to estimate the amount of additional spectrum that would be required to eliminate, or to reduce, the mutual interference. Since WRC-03 these statistics have been reviewed regularly to determine how much spectrum was required and in which part or parts of the 4-10 MHz region.

These studies have included all broadcasting requirements whether in the current bands allocated to the broadcasting service, the WARC-92 expansion bands available from 1 April 2007 and outside of these bands under RR No. **4.4**. Approximately 16% of transmitter hours are outside the bands allocated to the broadcasting service in the 4-10 MHz range.

These studies show that there has been a reduction of around 15% in total transmitter hours coordinated but that the demand for HF broadcasting spectrum in the frequency bands below 10 MHz has remained fairly constant. The results of an EBU questionnaire forecast that spectrum requirements are unlikely to decrease in the next 10 to 15 years. Peak demand is in local morning and evening periods which require spectrum in the range 4-10 MHz due to propagation considerations.

Table 1.13-1 uses the data for the currently allocated bands and the WARC-92 bands to give an estimation of the amount of additional spectrum required to reduce the co-channel and adjacent channel congestion. The data is the average for all seasons for B00 to B05.

TABLE 1.13-1

Collision statistics and estimated additional spectrum requirements

HF broadcast band (MHz)	Transmitter (h)	Mutual co-channel collision (h)	Mutual adj-channel collision (h)	Satisfied hours	Spectrum available (currently allocated and WARC-92 bands) (kHz)	Additional spectrum required to satisfy co-channel requirements (kHz)	Additional spectrum required to satisfy adj-channel requirements (kHz)	Percentage of satisfied (h)
4	70.6	1.4	2.5	67.2	50	1*)	2*)	95.3%
5	392.1	2.0	17.7	372.5	300	2*)	14*)	95.0%
6	2 726.7	378.1	981.5	1 609.8	300	70	183	59.0%
7	1 970.8	497.3	786.6	977.6	250	127	201	49.6%
9	2 909.9	474.7	1 147.6	1 568.9	500	151	366	53.9%
Total	8 070.0	1 353.4	2 935.8	4 596.0	1 400	352	766	51.7%

*) The low values in the table are the direct result of the statistical analysis. The 4 MHz and 5 MHz bands are allocated to the BS for use in the Tropical Zone on a shared basis with the FS. The results of the statistical examination indicate that there is almost no congestion but not all requirements in these bands have been submitted to the HFBC Coordination Groups

As a co-channel collision can also create an adjacent channel collision, the number of satisfied hours is not the result of subtracting co- and adjacent collisions hours from the total transmitter hours.

Table 1.13-1 shows that the amount of spectrum required is now in the range 350 kHz to satisfy the co-channel collisions to 770 kHz to satisfy co- and adjacent channel collisions. The difference from the analysis in Resolution **544 (WRC-03)** is due to the fact that since the original studies were conducted prior to WRC-03, sunspot activity has declined so more requirements fall within the lower bands.

5/1.13/4.3 Analysis of the results of studies

The analysis of the result of these studies show that the supply vs. demand deficit for HF broadcasting spectrum is at around 350 kHz for mitigation of co-channel interference and around 770 kHz for elimination of co-and adjacent channel interference[1] in the currently allocated and WARC-92 spectrum. These results are in line with the studies prepared in ITU-R for WRC-03 and included in Resolution **544 (WRC-03)**. The difference from the analysis in Resolution **544** is due to the fact that since the original studies were conducted prior to WRC-03, sunspot activity has declined so more requirements fall within the lower bands. If the impact of the current level of broadcasting in the OOB region under RR No. **4.4** is taken into account, the actual amount of spectrum required rises to somewhere in the range 650-1 000 kHz.

The greatest shortfall in spectrum is around 7 MHz, where more than 50% of transmission hours are compromised, followed closely by the 9 MHz and 6 MHz bands. In the 6-10 MHz bands, less than 60% of transmitter hours are free of co-and adjacent channel interference (see Table 1.13-1).The analysis of the operational schedules in the coordination groups (HFCC/ASBU/ABU-HFC) shows that an additional allocation of somewhere between 350 kHz to 770 kHz would be required to reduce the current level of congestion in the broadcasting bands between 4-10 MHz. The solution preferred by the broadcasting service is an additional allocation of 550 kHz (around midway between 350 kHz and 770 kHz) distributed as follows in Table 1.13-2:

TABLE 1.13-2

Additional allocations preferred by the broadcasting service

From (kHz)	To (kHz)	Total (kHz)
4 550	4 650	100
5 750	5 900	150
7 450	7 650	200
9 350	9 400	50
9 900	9 950	50

[1] This requirement is generated by transmission of the 10 kHz broadcast signal using a 5 kHz channel raster with appropriate geographical considerations.

At mid and high latitudes, propagation conditions at local dawn and evening periods demand the use of spectrum around 4 MHz and 5 MHz particularly in local winter and at mid-to-low sunspot activity. The only spectrum available at these latitudes is the bands 3 950-4 000 kHz in Region 1 and 3 900-4 000 kHz in Region 3. These fall just outside the 4-10 MHz range so have not been included in the statistical analysis. As the 4 MHz band in Region 1 is already heavily congested, broadcasters are using the 6 MHz and 7 MHz bands. If additional spectrum is made available at around 4-5 MHz, the level of congestion in the 6 MHz and possibly 7 MHz bands would be reduced.

The band 4 550-4 650 kHz is identified as a possible new band but consideration should also be given to extend the present 4 MHz band in Region 1 by 100 kHz as an alternative. The band 7 450-7 650 kHz assumes the situation after 29 March 2009.

The analysis of the operational schedules supported by monitoring observations show that much of the spectrum identified in Table 1.13-2 in the range 6-10 MHz is already occupied by broadcasting transmissions.

Economic factors: Both transmitters and transmission antennas designed for the existing broadcasting bands can generally accommodate extensions into higher or lower frequencies of 100 kHz or so. Some broadcasters may have difficulty with additional spectrum separated by gaps greater than this, particularly for transmitting antennas. Although there are high cost economic consequences for these broadcasters it is expected these will be solved during the transition period. DRM receivers will not be a problem.

Sharing considerations: Broadcasting is a one-way service and HF broadcasting requires higher transmission powers than other services. The broadcasting service has difficulty sharing the same frequency with other services into the same receive area. Time and geographical sharing within a band should be possible but several technical and operational factors must be taken into account. Some broadcasting transmissions are already made in fixed and mobile bands on a non-interference basis (RR No. **4.4**) with the approval of the administration on whose territory the transmitting station is located.

Transition arrangements: Any transition period should be as short as possible but give adequate time for the affected services to adjust in those bands where changes appear. It is also necessary to have a realistic period. Some administrations expect that any transition by the fixed and mobile services would need to be greater than 10 years. Others are of the opinion that the transition should be one or two years before the sunspot minimum, a critical factor for scheduling broadcast transmissions beyond human control, which is predicted to occur around 2018.

Some administrations are of the opinion that after implementation of the necessary extra spectrum for the Broadcasting Service, there will be no reason to schedule broadcasting transmissions below 10 MHz outside the procedures for RR Article **12** or the tropical bands. Administrations should take all necessary steps to discourage such activity.

Impact of digital transmissions for HFBC: Deployment of Digital System A, Digital Radio Mondiale (DRM), is expected to result in renewed interest in HFBC and hence a demand for additional programming. There is no means to quantify this until the economics of such a deployment begin to be realized. The effect on spectrum demand is expected to be neutral because the more dependable characteristics of DRM mean that it should be possible to reduce the multiplicity of simultaneous transmissions of the same program to the same broadcast area and still maintain an overall reliability close to the ideal planning objective of 95%. A single transmission is unlikely to achieve a reliability of more than 80%.

The experience so far shows that DRM transmissions of a programme stream are likely to be as a one for one replacement of the previous analogue service, obviating the need for more spectrum solely for the purpose of transition from analogue to digital. Digital HF broadcasting will improve the overall sharing conditions.

Digital radio services provide in improved reception quality. It would be desirable to give preference, as much as practicable, to introduction of digital services in any additional spectrum that may be allocated to the HF broadcasting service at WRC-07.

Identification of candidate bands:

A total of 3 360 kHz, including 850 kHz in the preferred bands, was reviewed. The bands preferred by the broadcasting service as candidate bands are still those identified in Resolution **544 (WRC-03)**.

5/1.13/5 Issue E

Review of allocations to all services in the HF bands between 4 MHz and 10 MHz

Resolutions **729 (WRC-97)**, **351 (WRC-03)** and **544 (WRC-03)** do not cover all elements of Agenda item 1.13. The task is to review the allocations to all services in the frequency range 4-10 MHz except those that are excluded. This section contains those issues that are not specific to any of the Resolutions and those elements where the Resolutions are interrelated.

5/1.13/5.1 Background

Interaction between Resolutions

Although the HF related proposals to WRC-03 showed divergence of views over the needs of each service involved, there were factors that emerged during the preparations for WRC-07 with a degree of consensus:

– the extensive and increasing use of the HF bands by the fixed and mobile services, which is being driven by new applications, new technology and the limitations of line-of-sight communications;

– increased sharing between services in the HF bands is a means to satisfy many conflicting requirements simultaneously;

– there is a need in HF broadcasting service for at least 250 kHz of spectrum needed to clear the co-channel collisions and up to 800 kHz to clear both the co-channel and adjacent channel collisions between 4 and 10 MHz as confirmed by the latest studies indicating the range is now 350 kHz to 770 kHz.

5/1.13/5.2 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant ITU-R Recommendations and Reports: ITU-R M.1732, ITU-R M.1042-2, PDNR M.[8A/LMS.CHAR.HF] (Doc. 8/BL/37), Report ITU-R M.2085.

(See also lists under Resolutions **729 (WRC-97)**, **351 (WRC-03)** and **544 (WRC-03)**.)

Broadcasting service

The summary of technical and operational studies for broadcasting is included in § 5/1.13/4.2.

Amateur services

The requirement for a 300 kHz worldwide allocation to the amateur service at 7 MHz was only partially satisfied at WRC-03. Amateur utilization of the band continues to increase, in part as a result of revision of RR Article **25**. The entire 300 kHz continues to be required by the amateur service in Region 2 and while the amateur allocation will increase from 100 to 200 kHz in Regions 1 and 3, a worldwide 300 kHz allocation to the amateur is still a requirement.

At times the maximum usable frequency (MUF) is below 7 MHz but is too far above the next lower amateur frequency band for communication to be supported in that band using typical amateur antennas and power levels. Depending on time of day, season and other propagation factors, the MUF is often such that access to spectrum around 5 MHz is essential for amateur stations to carry out their communications functions.

Fixed and mobile services

The summary of technical and operational studies for fixed and mobile services is contained in § 5/1.13/1.2 and 5/1.13/2.2.

5/1.13/5.3 Analysis of the results of studies

The results of studies for the broadcasting service are given in § 5/1.13/4.3.

Improvements in HF technology have increased the importance of HF radiocommunications. At present within 4-10 MHz range a great number of stations (more than several hundred thousand) operate in the fixed and mobile services. Application of these stations for long distance communication in sparsely populated, hard-to-access and remote areas is effective. In some cases it is the only means of communication. Reductions in the HF spectrum allocated to fixed and mobile services may constrain the use of advanced fixed and mobile technologies.

Transfer of existing frequency assignments of the fixed and mobile services to a spectral resource of the same volume, but located outside of considered frequency range, can lead to technical difficulties related to modification of the existing communication links. Substantial (several MHz) change of frequency influences the size of the areas in which reception is possible, distances between them and to displacement of their position with respect to desired point. Such frequency alteration also results in change of path length. Essential change of frequency for fixed and mobile stations in many cases will require network realignment and probable change of equipment.

5/1.13/5.3.1 Results of sharing studies between services in the 4-10 MHz range

Diverging views related to sharing studies are expressed below under i) and ii):

View i): Some administrations support the studies indicated below which show that additional sharing would be harmful to the fixed, land mobile and maritime mobile services.

Consideration was given to current usage of the 4-10 MHz band and results were provided for those situations where adaptive techniques are either not used or congestion of users limits the full effectiveness of adaptive systems.

View ii): Some other administrations find that, based on the procedures of the RR, established techniques developed in ITU-R through various WRC Resolutions and ITU-R Recommendations and taking into account the dimensions of frequency, time, and space in use of HF services, compatible and more efficient operation in the HF bands is feasible when bands are allocated for shared use.

5/1.13/5.3.1.1 Results of sharing studies between fixed service and the mobile service

View i): Given that some administrations already have heavy use of the existing fixed and mobile services allocations in the 3-30 MHz band, adaptive technologies often reach the maximum efficiency possible given the large number of systems attempting to access overlapping sets of frequency sets for their operation. Additional co-location sharing is not feasible since the increased congestion will often result in the lack of current adaptive technology systems to find sufficient clear channels that will propagate at a given time and place under ionosphere conditions. Increased generalized fixed and mobile service shared allocations in the 3-30 MHz band, as proposed by some other administrations, would be harmful to the fixed and mobile services given the extreme separation distance requirements for co-channel sharing.

View ii): The allocation of bands for generic shared use by the fixed and mobile services is considered to offer a compatible and more efficient use of the HF bands, noting that:

– several frequency bands between 4 and 30 MHz are already allocated on a shared basis to various radio services including the fixed and mobile services and, after 29 March 2009, the majority of bands between 4 and 10 MHz will have multiple uses, and that adaptive systems require access to as wide a range of spectrum as possible for optimum operation (see *considering a*) of Resolution **729 (WRC-97)**);

– distinctions between the fixed and mobile services have become less obvious as new applications and technologies are developed and deployed.

5/1.13/5.3.1.2 Results of sharing studies between the fixed and mobile services and the broadcasting service

View i): The results of the sharing analyses clearly show that the fixed and land mobile service will be adversely impacted by the broadcasting service in any situation where there is overlap of receive coverage area on the same frequency. Given that the typical receive coverage area for HF ionosphere transmissions is extremely large (thousands of kilometres), co-frequency overlap is likely. Adaptive HF systems for the fixed and mobile service would be unable to select any frequencies to establish links between stations where broadcasting coverage overlapped one of the fixed or mobile services stations. Some current sharing examples require limitations, often limited to a national level, to allow regulatory sharing between fixed/mobile and the broadcasting services.

View ii): The allocation of bands for shared use by the fixed, mobile and broadcasting services is considered to offer all the services access to spectrum in a compatible manner, noting that:

– the band 3 950-4 000 kHz (R1 and R3) is allocated to the fixed and broadcasting service without there being any specific sharing criteria;

– there are already examples of time managed and geographically managed sharing between the fixed and mobile services and the broadcasting service which, as these services operate on a time scheduled basis with a good degree of regularity, could be further developed;

– frequency agile fixed and mobile links can be designed to avoid collisions with scheduled broadcasting transmissions.

5/1.13/5.3.1.3 Results of sharing studies between the fixed and land mobile services with the maritime mobile service

View i): The results of the sharing analyses clearly show that the fixed and land mobile services will have a negative impact on the maritime mobile service in any sharing situation where there is an overlap of receive coverage area on the same frequency. The reverse situation is also true, maritime mobile service land station transmissions will have a negative impact on the fixed and land mobile services. Again, given that the receive coverage area for HF ionosphere transmissions are extremely large, co-frequency overlap is likely. Adaptive HF systems for the maritime mobile service would be unable to select any frequencies to establish links for the maritime mobile stations where fixed or land mobile services transmission coverage overlapped one of the maritime mobile service stations. This would show that compensation of fixed and mobile services allocations using RR Appendix **17** as proposed by some other administrations is not feasible and would result in mutual interference between the services.

View ii): The allocation of bands for shared use by the fixed and mobile services for links over land paths and the maritime mobile service is considered to offer all services access to spectrum in a compatible manner, noting that:

– new data exchange systems being developed for the maritime mobile service share many of the technical design and operational characteristics as modern systems developed for general use in the fixed and mobile services;

– there are sharing opportunities available because of the predominance below 8 MHz of near vertical incidence skywave (NVIS) techniques for short range/mobile service circuits over land which, for transmissions to or from the same general location/area, naturally operate at lower frequencies than the oblique incidence skywave paths predominating for longer distance links in the maritime mobile service; also frequency agile fixed and mobile links can be designed to avoid collisions.

5/1.13/5.3.1.4 Results of sharing studies between broadcasting and amateur services

Information on sharing scenarios in the HF bands is to be found in the Report of the Director to WRC-2000 in response to Resolution **29 (WRC-97)**. The study conclusions included that the sharing of frequency bands by the amateur service and broadcasting service is undesirable and should be avoided, because of system incompatibility. In spite of changes in technology and the introduction of new modes, these conclusions are still valid.

There are however examples of regional sharing on time basis of the broadcasting and amateur service as result of the decisions made at WRC-03 on 1.23.

5/1.13/5.3.2 Primary allocations to fixed and mobile services and secondary allocations to amateur service in the same frequency band

– Some administrations have indicated that amateur service stations may not detect weak or low power fixed service received signals and may interfere fixed service. In addition, frequency adaptive systems cannot differentiate between primary or secondary assignments and some assignments in the fixed system's frequency pool could become unusable. Many fixed service systems use a one way point-to-multipoint transmission and amateur service operators may decide to use an idle frequency, which may interfere with listening fixed service receivers or prevent fixed service receivers from receiving the signal when the channel becomes in use. Isolating the source of interference may also be difficult as the amateur stations are not required to operate on coordinated licensed frequencies.
– With experience operating in crowded HF bands, many amateur operators understand that interference is possible and continuously monitor transmissions to minimize the probability. The band 10 100-10 150 kHz is allocated to the fixed service on a primary basis and the amateur service on a secondary basis, but in some countries the band is allocated to the amateur service on an exclusive basis.

5/1.13/5.3.3 Timeline impact

In defining a transition date all elements for this transition should be taken into account. Adequate time for the affected services to adjust changes is important, although also the need to have the spectrum as soon as possible available, by the service who needs the extra spectrum, should be taken into account. Therefore it is needed to have a realistic termination date for the transition. Some administrations are of the opinion that the transition should be a maximum of one or two years before the sunspot minimum, which is predicted to occur around 2018.

Any transition timeline should take into account the technical and economic difficulties of adjusting users to new portions of the HF spectrum. It should be of sufficient time to ensure successful migration of users taking into account equipment life-cycles. Based on technical analysis of the impact to the fixed and mobile services some other administrations believe that transition would require 15+ years for any further allocation to the broadcasting service or to more general allocations to the fixed and mobile services.

5/1.13/5.4 Conclusions about the study results

Possible reallocation of frequency bands in the range 4-10 MHz for the benefit of broadcasting may create difficulty for existing radio services (fixed and mobile).

Transfer of fixed and mobile services to other frequency bands and introduction of adaptive frequency management methods should take into account factors connected with implementing such a transition.

5/1.13/6 Methods to satisfy the agenda item

Each method below responds in part or in all to specific resolutions of the agenda item or the overall review of the agenda item itself. Multiple methods will need to be considered to resolve Agenda item 1.13.

5/1.13/6.1 Method 1 (Issue A and B)

This method responds only to Resolution **729 (WRC-97)**.

No modification of RR Article **5**. Modification to Resolution **729 (WRC-97)** is needed to indicate that further studies are not necessary.

Advantages:

– Recognizes the current implementation of adaptive techniques for fixed and mobile applications in the 2-30 MHz band.

Disadvantages:

– None.

5/1.13/6.2 Method 2 (Issue C)

This method responds only to Resolution **351 (WRC-03)**.

Introduction of new digital MF/HF technology based on one or more interoperable worldwide technology described in Recommendation ITU-R M.[HF-DATA] (Document 8/161(Rev.1)).

Revisions to RR Appendix **17** in WRC-2007, taking into account the need to retain compatibility and channels for residual traditional communication methods and transition to new MMS digital technologies. It will be necessary to identify within RR Appendix **17** the frequencies that must be retained for the NBDP and MSI purpose (i.e. the frequencies of RR Appendix **15**).

Since new digital technologies for maritime service that are becoming widely used and are growing, it is necessary to identify more frequencies within RR Appendix **17** for such new services without pre-empting or interfering with remaining NBDP use for distress and MSI frequencies.

Some administrations will require the use of NBDP paired frequencies until at least 2012.

Advantages:

– Customer demand for new digital technologies is accommodated. Harmonization of such systems is achieved.

– An efficient spectrum transition from Morse telegraphy, radiotelephony, NBDP to new MMS digital technologies is achieved. Some NBDP functionality is retained to meet distress, MSI and general communication requirements in the poor propagation conditions of sea area A4. The availability of MMS communication is maximized by retaining fractional frequencies for remaining NBDP purposes and making the rest of RR Appendix **17** bands available for use by new maritime data exchange systems.

Disadvantages:

– None.

5/1.13/6.3 Method 3 (Issue D)

This method responds only to Resolution **544 (WRC-03)** and contains two examples.

Additional allocation between a minimum of 250 to a maximum of 800 kHz in total to HF broadcasting service in the 4-10 MHz frequency range.

Advantages:

– Depending on the amount of spectrum allocated, it will clear the co-channel and partly/fully the adjacent channel collisions.

– The quality of the broadcasting service will be enhanced, enabling proper utilization of expenditure that administrations spend annually on operating this service.

– This will help to facilitate introduction of digital radio broadcasting services.

– If the additional allocations to the broadcasting service are made in the "preferred bands" noted in Resolution **544 (WRC-03)**, the economic burden for the broadcasters is minimized because most existing transmitter/antenna combinations can accommodate such extrapolations.

Disadvantages:

– Depending on the amount of spectrum allocated, it may not completely clear adjacent channel collisions.

– The spectrum would come at the expense of the fixed and mobile services. These services have already suffered losses at WARC-79 (125 kHz), WRC-92 (790 kHz to become available from April 2007 of which 200 kHz is in the 4-10 MHz range) and WRC-03 (50 kHz in Region 2 to become available from 2009).

– Essential and critical fixed and mobile services applications as well as new and growing technologies for HF Internet services, email, data exchange, fax, messaging, imagery, and voice will be adversely affected or be terminated due to the increase in fixed and mobile spectrum congestion and the non-availability of spectrum that will result depending on the amount of spectrum allocated to the broadcasting service.

– Critical government long-range sky-wave communications will be difficult to maintain 24 h a day due to constant ionosphere changes and non-availability of spectrum throughout the entire 4-10 MHz range depending on the amount of spectrum allocated to the broadcasting service.
– Fixed and mobile users of the affected bands will migrate where practical to adjacent fixed and mobile service bands, thereby increasing channel occupancy in those bands. Presently, some administrations are already having difficulties finding replacement spectrum for the bands they will be vacating in 2007 and 2009. Relocating additional existing fixed and mobile service assignments into other bands may be impossible depending on the amount of spectrum allocated to the broadcasting service.
– Change of frequency for stations of the fixed and mobile services can require substantial financial, time and resource expenditures for frequency coordination, communication networks realignment and probable change of equipment.
– Additional obstacles to a wider introduction of frequency adaptive systems will be created.
– If additional allocations to the broadcasting service are made on a shared basis only, this will give an unacceptable burden to the FS and MS.

Example 1

As an example: a new allocation of 350 kHz to the broadcasting service with a date of implementation on 25 March 2018, consisting of 200 kHz of exclusive allocation for the broadcasting service from the fixed and mobile services and 150 kHz which is shared between broadcasting and fixed /mobile services. Some administrations believe the final implementation date is sufficiently far enough to allow the transition between fix/mobile services and the broadcasting service. Some other administrations believe that the implementation date would need to be for the year 2022 or beyond with review at a competent conference prior to final implementation.

The method proposed under Issue E (§ 5/1.13/6.5 Method 5 (Issue E)) provides for 350 kHz of shared spectrum with the maritime mobile service for the fixed and mobile services. This spectrum is in the non-channelling part of RR Appendix **17** which some administrations believe this is outside the scope of the agenda. Under that respect both proposals for Issues D and E are linked.

Example 2

As an example: A new allocation of 350 kHz to the broadcasting service with a date of implementation on 25 March 2018, which is shared between broadcasting and fixed/mobile services. Some administrations believe the final implementation date is sufficiently far enough to allow the transition between fixed/mobile services and the broadcasting service. Some other administrations believe that the implementation date would need to be for the year 2022 or beyond with review at a competent conference prior to final implementation.

Two opinions have been expressed under this Method regarding both examples above.

Opinion 1 is to allocate additional frequencies to international broadcasting without provisions imposing sharing conditions between the broadcasting and fixed/mobile services, if allocated on a co-primary basis.

Opinion 2 is that provisions imposing regulatory and/or technical sharing conditions between the broadcasting and fixed/mobile services are needed, if allocated on a co-primary basis.

An example regulatory text for Opinion 1 is provided in § 7.3.1. An example regulatory text for Opinion 2 is provided in § 7.3.2.

5/1.13/6.4 Method 4 (Issue D)

This method responds only to Resolution **544 (WRC-03)**.

No additional allocation to HF broadcasting service in the 4-10 MHz frequency range.

Advantages:

– Fixed and mobile services do not lose spectrum.

– All services will continue to support existing and future applications with the spectrum currently allocated.

– No expensive and complicated realignment process that only benefits one service.

– Existing congestion and interference in this portion of the HF band will not increase for the fixed and mobile services.

Disadvantages:

– Broadcasting requirement for 250 kHz of additional spectrum to clear co-channel collisions and up to 800 kHz to clear both the co-channel and adjacent channel collisions is not achieved.

– Substantive amounts of operating expenditure of concerned administrations will continue to provide low quality service.

5/1.13/6.5 Method 5 (Issue E)

This method responds only to the review of allocations to all services.

Some administrations are of the opinion that this method is outside of the agenda item.

Allocation of frequency bands to the most broadly defined services

Provide the fixed and mobile services access to additional spectrum by following the philosophy of *recommends* 1 of Recommendation **34 (WRC-95)**.

Modify allocations in all those bands which include allocations to the fixed or mobile services, but excluding those with flight safety uses or subject to the allotment or channel plans contained in RR Appendices **17**, **25**, **26** or **27**, to make the bands available to the “FIXED and MOBILE except aeronautical mobile (R)” services on a primary basis. Other allocations or RR Article **5** footnotes conditioning the use of these bands would remain unchanged.

The possibility of co-existence between the fixed and land mobile services within land masses (utilizing NVIS) and the maritime mobile service has been observed. This would also help to overcome the effects of Method 3 (Issue D) for Resolution **544 (WRC-03)**where the loss of spectrum by the fixed and mobile services in the 4, 5, 9 MHz bands are balanced by the sharing between fixed, land mobile services and maritime mobile in the 4, 6, 8 MHz bands.

Two opinions have been expressed under this Method about sharing between broadcasting and fixed/mobile services.

Opinion 1 is to allocate additional frequencies to international broadcasting without provisions imposing sharing conditions between the broadcasting and fixed/mobile services.

Opinion 2 is that provisions imposing regulatory and/or technical sharing conditions between the broadcasting and fixed/mobile services are needed.

An example regulatory text for Opinion 1 is provided in § 7.5.1. An example regulatory text for Opinion 2 is provided in § 7.5.2.

Advantages:

– Recognizes the increasing use of modern digital data exchange systems in the fixed and mobile service.

– Will enable the fixed and mobile services to make more effective use of the HF spectrum by giving greater flexibility to select the most appropriate frequency of operation for an HF circuit and thus maintain a higher level of communications reliability.

– Allows the fixed and mobile services access to larger allocations of spectrum through a combination of natural and controlled time sharing possibilities.

Disadvantages:

– Will require much time and funds for re-equipment of existing stations since overwhelming majority of these stations are not equipped to operate in adaptive frequency management mode. May also require additional time and funds given high number of stations operating in this range in a number of administrations. Analyses indicate that additional sharing between the fixed/mobile services and the maritime mobile service is not feasible. General allocations and sharing within those parts of RR Appendix **17** which are currently exclusively allocated to the MMS, will not provide any additional spectrum for the fixed and mobile service based on the required sharing conditions and will lead to harmful impact to the maritime mobile service. This may hinder introduction of advanced HF systems.

5/1.13/6.6 Method 6 (Issue E)

This method responds only to Issue E (the review of allocations to all services).

Modifications to RR Article **5** to provide a worldwide secondary allocation to the amateur service of 150 kHz at 5 260-5 410 kHz.

Some administrations are of the opinion that this method is outside the agenda item.

Advantages:

– Provides propagation at times when MUF is below 7 MHz and LUF is above 4 MHz permitting reliable communication for radio amateurs at any time of the day and support Report ITU-R M.2085.

Disadvantages:

– An allocation to the amateur service at 5 MHz would reduce available spectrum for the fixed and mobile service by increasing congestion, removing channels from use when adaptive fixed and mobile systems are used, and will have impact on additional allocations for the broadcasting service and proposed compensation also under discussion (Method 3 and 5).

5/1.13/6.7 Method 7 (Issue E)

This method responds only to Issue E (review of allocations to all services).

Modifications to RR Article **5** to provide a worldwide primary allocation to the amateur service of 7 200-7 300 kHz.

Some administrations are of the opinion that this method is outside the agenda item.

Advantages:

– Global harmonization of amateur allocations on 7 MHz.

– Removal of interregional amateur/broadcasting incompatibility.

Disadvantages:

– Reduces the spectrum currently allocated to HF broadcasting service in Regions 1 and 3. This impact will not only obstruct the current broadcasting service but also prevent the future development of broadcasting service in the 7 MHz band in Regions 1 and 3.

– Significantly complicates the problem of identifying the spectrum for the broadcasting service and will impact broadcasting stations, which will be required to relocate in different portions of the spectrum, as was found in the case of the band-shifting in 7 MHz at WRC-03.

5/1.13/6.8 Method 8 (Issue E)

This Method responds to Issue A, B, D and E

No additional allocations to any service and no additional co-service sharing in the 4-10 MHz frequency range.

Advantages:

– The advantages are covered under the Methods in § 5/1.13/6.1–5/1.13/6.5.

Disadvantages:

– The disadvantages are covered under the Methods in § 5/1.13/6.1–5/1.13/6.5.

5/1.13/7 Regulatory and procedural considerations

5/1.13/7.1 Regulatory and procedural considerations for Method 1 (Issue A and B)

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RESOLUTION 729 (Rev.WRC-~~97~~07)

Use of frequency adaptive systems in the MF and HF bands

The World Radiocommunication Conference (Geneva, ~~1997~~2007),

considering

NOC *a), b)* and *c),*

d) that ~~following Resolution **23 (WRC-95)***, ~~the Radiocommunication Bureau no longer undertakes examination with respect to the probability of harmful interference caused by new assignments recorded in the Master International Frequency Register (MIFR) in the non-planned bands below 28 MHz;

NOC *e)*

resolves

~~* *Note by the Secretariat*: This Resolution was abrogated by WRC-2000.~~

NOC 1 to 4

~~*invites ITU-R*~~

~~1 to pursue its studies on the subject (see, for example, Questions ITU-R 204-1/1, ITU-R 147-1/9, ITU-R 205/9 or ITU-R 214/9) with a view to achieving optimum operational performance and compatibility;~~

~~2 to report on the results of these studies to a future world radiocommunication conference,~~

~~*instructs the Director of the Radiocommunication Bureau*~~

~~to make the necessary arrangements, as soon as practicable, for the notification of frequency assignments to adaptive systems and for their recording in the MIFR, taking into account the studies already undertaken.~~

5/1.13/7.2 Regulatory and procedural considerations for Method 2 (Issue C)

Proposed detailed modifications to RR Appendix **17** are contained in ITU-R Report M.2082. Administrations may use this Report to develop proposals for WRC-2007. The following proposed changes are an example of how RR Appendix **17** could be modified, solely the 4 and 6 MHz are treated in this example, same kind of modifications could be apply in the rest of the Appendix.

APPENDIX 17 (Rev.WRC-03)

Frequencies and channelling arrangements in the high-frequency bands for the maritime mobile service

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PART A – Table of subdivided bands (WRC-0~~3~~7)

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service

Band (MHz)	**4**	**6**
Limits (kHz)	4 063	6 200
Frequencies assignable to ship stations for oceanographic data transmission *c)*	**4 063.3** to **4 064.8** *6 f.* *0.3 kHz*	
Limits (kHz)	4 065	6 200
Frequencies assignable to ship stations for telephony, duplex operation *a) i), p)*	**4 066.4** to **4 144.4** *27 f.* *3 kHz*	**6 201.4** to **6 222.4** *8 f.* *3 kHz*
Limits (kHz)	4 146	6 224
Frequencies assignable to ship stations and coast stations for telephony, simplex operation *a), p)*	**4 147.4** to **4 150.4** *2 f.* *3 kHz*	**6 225.4** to **6 231.4** *3 f.* *3 kHz*
Limits (kHz)	4 152	6 233
Frequencies assignable to ship stations for wide-band telegraphy, facsimile and special transmission systems *p)*	**4 154** to **4 170** *5 f.* *4 kHz*	**6 235** to **6 259** *7 f.* *4 kHz*

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*continued*)

Band (MHz)	**4**	**6**
Limits (kHz)	4 172	6 261
Frequencies assignable to ship stations for oceanographic data transmission *c), p)*		**6 261.3** to **6 262.5** *5 f.* *0.3 kHz*
Limits (kHz)	4 172	6 262
Frequencies assignable to ship stations for wide-band telegraphy, facsimile and special transmission systems *p)*	**4 174** *1 f.* *4 kHz*	**6 264** *1 f.* *4 kHz*
Limits (kHz)	4 17~~2~~6	6 26~~2.75~~6
Frequencies (paired) assignable to ship stations for narrow-band direct-printing (NBDP) telegraphy and data transmission systems at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK *d) j) m) ~~p)~~*	**4 17~~2.5~~6.5** to **4 1~~81.5~~79** *~~18~~5 f.* *0.5 kHz*	**6 26~~3~~6.5** to **6 27~~5.5~~0** *~~25~~7 f.* *0.5 kHz*
Limits (kHz)	4 1~~81.75~~79.25	6 27~~5.75~~0.25
~~Calling frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~Frequencies assignable to ship stations for data transmission *~~g)~~ p)*		
Limits (kHz)	4 186.75	6 284.75
Limits (kHz)	4 186.75	6 28~~0~~4.75
~~Frequencies (paired) assignable to ship stations for NBDP telegraphy and data transmission systems at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK *d) m) p)*~~		~~**6 281**~~ ~~to~~ ~~**6 284.5**~~ ~~*8 f.*~~ ~~*0.5 kHz*~~
~~Limits (kHz)~~	~~4 186.75~~	~~6 284.75~~
~~Working frequencies assignable to ship stations for A1A or A1B Morse telegraphy~~Frequencies assignable to ship stations for data transmission *~~e) f)~~ h) p)*	**4 187** to **4 202** ~~*31 f.*~~ ~~*0.5 kHz*~~	**6 285** to **6 300** ~~*31 f.*~~ ~~*0.5 kHz*~~

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*continued*)

Band (MHz)	**4**	**6**
Limits (kHz)	4 202.25	6 300.25
. . .		
Frequencies (non paired) assignable to ship stations for ~~NBDP telegraphy and~~ data transmission systems ~~at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK and for A1A or A1B Morse telegraphy (working)~~ *b) p)*	**4 202.5** to **4 207** ~~*10 f.*~~ ~~*0.5 kHz*~~	**6 300.5** to **6 311.5** ~~*23 f.*~~ ~~*0.5 kHz*~~
Limits (kHz)	4 207.25	6 311.75
Frequencies assignable to ship stations for digital selective calling *k) l)*	**4 207.5** to **4 209** *4 f.* *0.5 kHz*	**6 312** to **6 313.5** *4 f.* *0.5 kHz*
Limits (kHz)	4 209.25	6 313.75
Frequencies assignable to coast stations for data transmission *n), o), p)*		
Limits (kHz)	4 214~~09.25~~	6 31~~3.75~~7.5
Frequencies (paired) assignable to coast stations for NBDP and data transmission systems, at speeds not exceeding 100 Bd for FSK and 200 Bd for PSK *d) ~~n) o) p)~~*	**4 2~~09.5~~14.25** to **4 21~~9~~6.25** *~~20~~6 f.* *0.5 kHz*	**6 31~~4~~7.75** to **6 3~~30.5~~20.75** *~~34~~8 f.* *0.5 kHz*
Limits (kHz)	4 21~~9.25~~6.5	6 3~~30.75~~21
Limits (kHz)	4 216.5	6 321
Frequencies assignable to coast stations for data transmission *p)*		
Limits (kHz)	4 219.25	6 330.75
Frequencies assignable to coast stations for digital selective calling *l)*	**4 219.5** to **4 220.5** *3 f.* *0.5 kHz*	**6 331** to **6 332** *3 f.* *0.5 kHz*

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service (*end*)

Band (MHz)	**4**	**6**
Limits (kHz)	4 221	6 332.5
Frequencies assignable to coast stations for wide-band ~~and A1A or A1B Morse telegraphy~~, facsimile, special and data transmission systems and direct-printing telegraphy systems *p)*		
Limits (kHz)	4 351	6 501
Frequencies assignable to coast stations for telephony, duplex operation *a) p)*	**4 352.4** to **4 436.4** *29 f.* *3 kHz*	**6 502.4** to **6 523.4** *8 f.* *3 kHz*
Limits (kHz)	4 438	6 525

NOC Notes *a)* to *d)*

SUP Notes *e)* to *g)*

NOC Notes *h)* to *l)*

SUP Note *m)*

NOC Notes *n)* to *o)*

MOD

p) These sub-bands, except the frequencies referred to in Notes *j), n)* and *o)*, ~~may~~could be also used for the initial testing and the ~~possible future~~ introduction within the maritime mobile service of new digital technologies described in Recommendation ITU-R M.[HF-DATA] (Document 8/161). ~~Stations using these sub-bands for this purpose shall not cause harmful interference to, and shall not claim protection from, other stations operating in accordance with Article 5.~~

MOD

PART B – Channelling arrangements

Section I – Radiotelephony

ADD

6 *d)* The channelling arrangement specified in the sub-sections A and B does not prejudice the rights of administrations to establish, and to notify assignments to stations in the maritime mobile service other than those using radiotelephony, provided that:

– the occupied bandwidth does not exceed 2 800 Hz and is situated wholly within one frequency channel.

Reasons: This will allowed the use of digital technology by the administrations within the maritime radiotelephone for coast and ship stations.

Section II – Narrow-band direct-printing telegraphy (paired frequencies)

MOD

Table of frequencies for two-frequency operation by coast stations (kHz)

Channel No.	4 MHz band [1]		6 MHz band [3]	
	Transmit	Receive	Transmit	Receive
1	~~4 210.5~~	~~4 172.5~~	~~6 314.5~~	~~6 263~~
2	~~4 211~~	~~4 173~~	~~6 315~~	~~6 263.5~~
3	~~4 211.5~~	~~4 173.5~~	~~6 315.5~~	~~6 264~~
4	~~4 212~~	~~4 174~~	~~6 316~~	~~6 264.5~~
5	~~4 212.5~~	~~4 174.5~~	~~6 316.5~~	~~6 265~~
6	~~4 213~~	~~4 175~~	~~6 317~~	~~6 265.5~~
7	~~4 213.5~~	~~4 175.5~~	6 317.5	6 266
8	4 214	4 176	6 318	6 266.5
9	4 214.5	4 176.5	6 318.5	6 267
10	4 215	4 177	6 319	6 267.5
11	4 177.5 [2]	4 177.5 [2]	6 268 [2]	6 268 [2]
12	4 215.5	4 178	6 319.5	6 268.5
13	4 216	4 178.5	6 320	6 269
14	4 216.5	4 179	6 320.5	6 269.5
15	~~4 217~~	~~4 179.5~~	6 321	6 270
16	~~4 217.5~~	~~4 180~~	~~6 321.5~~	~~6 270.5~~
17	~~4 218~~	~~4 180.5~~	~~6 322~~	~~6 271~~
18	~~4 218.5~~	~~4 181~~	~~6 322.5~~	~~6 271.5~~
19	~~4 219~~	~~4 181.5~~	~~6 323~~	~~6 272~~
20			~~6 323.5~~	~~6 272.5~~
21			~~6 324~~	~~6 273~~
22			~~6 324.5~~	~~6 273.5~~
23			~~6 325~~	~~6 274~~
24			~~6 325.5~~	~~6 274.5~~
25			~~6 326~~	~~6 275~~
26			~~6 326.5~~	~~6 275.5~~
27			~~6 327~~	~~6 281~~
28			~~6 327.5~~	~~6 281.5~~
29			~~6 328~~	~~6 282~~
30			~~6 328.5~~	~~6 282.5~~
31			~~6 329~~	~~6 283~~
32			~~6 329.5~~	~~6 283.5~~
33			~~6 330~~	~~6 284~~
34			~~6 330.5~~	~~6 284.5~~
35				

. . .

Section III – Narrow-band direct-printing telegraphy (non-paired frequencies)

SUP

The entire Section III could be deleted from Part B of RR Appendix **17**.

Reason: With modification in Part A, it is not any more a NBDP band but frequencies bands assignable to ship stations for data transmission systems.

Section IV – Morse telegraphy (calling)

SUP

The entire Section IV of Part B of RR Appendix **17** is proposed for suppression.

Section V – Morse telegraphy (working)

SUP

The entire Section V of Part B of RR of Appendix **17** is proposed for suppression.

Note: A footnote has to be added to authorize the administrations to use those frequencies for Morse telegraphy if they want. They could not claim protection for such usage.

5/1.13/7.3 Regulatory and procedural considerations for Method 3 (Issue D)

This section contains partial example regulatory text for the method described in § 5/1.13/6.3. It presents an example of revisions to the Table of Frequency Allocations, a new Resolution **ZZ (WRC-07)** in order to define the transition period for the spectrum allocated to the broadcasting service at WRC-07 and subsequent changes to RR Articles **12** and **23**. Depending on action taken at the conference, additional applications of the example modifications to the RR shown below will be required for each frequency band.

5/1.13/7.3.1 Example regulatory text for Example 1, Opinion 1 (§ 5/1.13/6.3)

3 230-5 003 kHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td colspan="2">4 438-4 ~~650~~550
FIXED
MOBILE except aeronautical mobile (R)</td><td>4 438-4 ~~650~~550
FIXED
MOBILE except aeronautical mobile</td></tr>
<tr><td colspan="3">4 550-4 650 BROADCASTING
FIXED
MOBILE except aeronautical mobile (R)
5.AAA</td></tr>
</table>

ADD – Example footnote

5.AAA Until 25 March 2018, the band 4 550-4 650 kHz is allocated to the fixed service on a primary basis, as well as to the following services: in Region 1 and 2 to the mobile except aeronautical mobile (R) service on a primary basis, in Region 3 to the mobile except aeronautical mobile service on a primary basis.

From 25 March 2018, the band 4 550-4 650 kHz is allocated to the fixed, mobile except aeronautical mobile (R) and broadcasting services on a primary basis.

5 003-7 450 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
5 060-5 ~~250~~110	FIXED ~~Mobile~~MOBILE except aeronautical mobile ~~5.133~~ BROADCASTING 5.BBB	
5 ~~250~~110-5 450	FIXED MOBILE except aeronautical mobile 5.CCC 5.133	
...		
~~**5 730-5 900**~~ ~~FIXED~~ ~~LAND MOBILE~~	~~**5 730-5 900**~~ ~~FIXED~~ ~~MOBILE except aeronautical mobile (R)~~	~~**5 730-5 900**~~ ~~FIXED~~ ~~Mobile except aeronautical mobile (R)~~
5 730-5 790	FIXED MOBILE except aeronautical mobile (R) 5.DDD	
5 ~~900~~790-5 95~~0~~00	BROADCASTING ~~5.134~~ ~~5.136~~5.EEE	
5 95~~0~~00-6 200	BROADCASTING 5.134 5.136	

ADD – Example footnote

5.BBB Until 25 March 2018, the band 5 060-5 110 kHz is allocated to the fixed service on a primary basis and to the mobile except aeronautical mobile service on a secondary basis.

ADD – Example footnote

5.CCC Until 25 March 2018, the band 5 110-5 250 kHz is allocated to the fixed service on a primary basis and to the mobile except aeronautical mobile service on a secondary basis. From 25 March 2018, this band is allocated to the fixed and mobile except aeronautical mobile services on a primary basis.

ADD – Example footnote

5.DDD Until 25 March 2018, the band 5 730-5 790 kHz is allocated to the fixed service on a primary basis, as well as to the following services: in Region 1 to the land mobile service on a primary basis, in Region 2 to the mobile except aeronautical mobile (R) service on a primary basis, and in Region 3 to the mobile except aeronautical mobile (R) service on a secondary basis. From 25 March 2018 this band is allocated to the fixed and mobile except aeronautical mobile (R) services on a primary basis.

MOD

5.134 The use of the bands 5 900-5 950 kHz, 7 300-7 350 kHz, 9 400-9 500 kHz, 11 600-11 650 kHz, 12 050-12 100 kHz, 13 570-13 600 kHz, 13 800-13 870 kHz, 15 600-15 800 kHz, 17 480-17 550 kHz, ~~and~~ 18 900-19 020 kHz and from 25 March 2018 the bands 5 790-5 900 kHz, 9 350-9 400 kHz[*], 9 900-9 940 kHz[*] by the broadcasting service ~~as from 1 April 2007~~ is subject to the application of the procedure of Article **12**. Administrations are encouraged to use these bands to facilitate the introduction of digitally modulated emissions in accordance with the provisions of Resolution **517 (Rev.WRC-03)**. (WRC-~~03~~07)

MOD

5.136 ~~The band 5 900-5 950 kHz is allocated, until 1 April 2007, to the fixed service on a primary basis, as well as to the following services: in Region 1 to the land mobile service on a primary basis, in Region 2 to the mobile except aeronautical mobile (R) service on a primary basis, and in Region 3 to the mobile except aeronautical mobile (R) service on a secondary basis, subject to application of the procedure referred to in Resolution **21 (Rev.WRC-95)***. After 1 April 2007,~~The frequencies in the~~is~~ band 5 900-5 950 kHz may be used by stations in the ~~above-mentioned~~fixed and mobile except aeronautical mobile (R) services, communicating only within the boundary of the country in which they are located, on the condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations.

[*] The modifications to the Table of frequency allocations for the 9 MHz band references shown in this footnote were not included, as the text in this section is only a partial example of regulatory text. Decision by the Conference on any allocation will determine any required changes to No. 5.134.

ADD

5.EEE Until 25 March 2018, the band 5 790-5 900 kHz is allocated to the fixed service on a primary basis, as well as to the following services: in Region 1 to the land mobile service on a primary basis, in Region 2 to the mobile except aeronautical mobile (R) service on a primary basis, and in Region 3 to the mobile except aeronautical mobile (R) service on a secondary basis, subject to application of the procedure referred to in Resolution **ZZ (WRC-07)**. From 25 March 2018, frequencies in this band may be used by stations in the fixed and the mobile except aeronautical mobile (R) services, communicating only within the boundary of the country in which they are located, on condition that harmful interference is not caused to the broadcasting service. When using frequencies for these services, administrations are urged to use the minimum power required and to take account of the seasonal use of frequencies by the broadcasting service published in accordance with the Radio Regulations.

ADD

New Resolution **ZZ** (Implementation of changes in frequency allocations between 5 790 kHz and 9 940 kHz).

This new Resolution **ZZ** will be based on the model of Resolution **21**, taking into account that since Resolution **21** originally came into force following WARC-92, other conference decisions have had an impact on the implementation of the procedure contained in the Resolution. On 8 September 2004, the Radiocommunication Bureau published Circular Letter CR/218 giving details of these changes, actions already taken and proposals on the way forward.

Example modification of RR Article 12

MOD

ARTICLE 12

Seasonal planning of the HF bands allocated to the broadcasting service between 5 ~~900~~790 kHz and 26 100 kHz

Section I – Introduction

12.1 The use of the frequency bands allocated to high frequency broadcasting (HFBC) between 5 ~~900~~790 kHz and 26 100 kHz shall be based on the principles given below and shall be in conformity with seasonal planning based on a coordination procedure between administrations (referred in this Article as the Procedure) described in **12.2** to **12.45**. An administration may authorize a broadcasting organization (referred to in this Article as a broadcaster), among others, to act on its behalf in this coordination.

Example modification of RR Article 23

MOD

ARTICLE 23

Broadcasting services

Section I – Broadcasting service

23.1 *A – General*

23.2 § 1 1) The establishment and use of broadcasting stations (sound broadcasting and television broadcasting stations) on board ships, aircraft or any other floating or airborne objects outside national territories is prohibited.

23.3 2) In principle, except in the frequency bands 3 900-4 000 kHz and from 25 March 2018 in the frequency bands 4 550-4 650 kHz, broadcasting stations using frequencies below 5 060 kHz or above 41 MHz shall not employ power exceeding that necessary to maintain economically an effective national service of good quality within the frontiers of the country concerned.

5/1.13/7.3.2 Example regulatory text for Examples 1 and 2, Opinion 2 (5/1.13/6.3)

3 230-5 003 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
4438-4 550 ~~4650~~ FIXED MOBILE except aeronautical mobile (R)		**4438-4 550 ~~4650~~** FIXED MOBILE except aeronautical mobile
4 550-4 650 BROADCASTING 5.VVV FIXED MOBILE except aeronautical mobile (R) 5.AAA		

ADD

5.AAA Until 25 March 2018, the band 4550-4650 kHz is allocated to the fixed service on a primary basis, as well as to the following services: in Region 1 and 2 to the mobile except aeronautical mobile (R) service on a primary basis, in Region 3 to the mobile except aeronautical mobile service on a primary basis.

From 25 March 2018, the band 4550-4650 kHz is allocated to the fixed, mobile except aeronautical mobile (R) and broadcasting services on a primary basis. (WRC-07)

ADD

5.VVV After 25 March 2018, the use of broadcasting service in the frequency bands 4 550-4 650 kHz and 5 060-5 110 kHz shall be in accordance with Resolution **NNN (WRC-07)**. (WRC-07)

Note: *Resolution **NNN (WRC-07)** should include regulatory and/or technical conditions for sharing broadcasting service with existing services including restrictions to transmitting power, geographical areas and operating time of transmitting broadcasting stations.*

5 003-7 450 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
5060-5110 ~~5250~~	FIXED ~~Mobile~~MOBILE except aeronautical mobile ~~5.133~~ BROADCASTING 5.VVV 5.BBB	
5110 ~~5250~~-5450	FIXED MOBILE except aeronautical mobile 5.CCC 5.133	

ADD

5.BBB Until 25 March 2018, the band 5 060-5 110 kHz is allocated to the fixed service on a primary basis and to the mobile except aeronautical mobile service on a secondary basis. (WRC-07)

ADD

5.CCC Until 25 March 2018, the band 5 110-5 250 kHz is allocated to the fixed service on a primary basis and to the mobile except aeronautical mobile service on a secondary basis. From 25 March 2018, this band is allocated to the fixed and mobile except aeronautical mobile services on a primary basis. (WRC-07)

5/1.13/7.4 Regulatory and procedural considerations for Method 4 (Issue D)

To address this Method, no changes would be required to RR Article **5** but action would need to be taken on Resolution **544 (WRC-03)**.

5/1.13/7.5 Regulatory and procedural considerations for Method 5 (Issue E)

This section contains partial example regulatory text of the method described in § 5/1.13/6.5. It presents an example of revisions to the Table of Frequency Allocations and it has to be noted that the start of changes took place after the change implemented under § 5/1.13/6.3. Depending on action taken at the conference, additional applications of the example modifications to the RR shown below will be required for each frequency band.

5/1.13/7.5.1 Example regulatory text for Opinion 1 (§ 5/1.13/6.5)

3 230-5 003 kHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td>4 063-4 <s>438</s><u>271</u></td><td colspan="2">MARITIME MOBILE 5.79A 5.109 5.110 5.130 5.131 5.132
5.128 5.129</td></tr>
<tr><td><u>4 271-4 351</u></td><td colspan="2"><u>FIXED</u>
<u>MOBILE except aeronautical mobile (R)</u>
<u>5.129 5.MM1</u></td></tr>
<tr><td><u>4 351-4 438</u></td><td colspan="2"><u>MARITIME MOBILE</u>
<u>5.128 5.129</u></td></tr>
<tr><td colspan="2">4 438-4 <s>650</s><u>550</u>
FIXED
MOBILE except aeronautical mobile (R)</td><td>4 438-4 <s>650</s><u>550</u>
FIXED
MOBILE except aeronautical mobile</td></tr>
<tr><td><u>4 550-4 650</u></td><td colspan="2"><u>BROADCASTING</u>
<u>FIXED</u>
<u>MOBILE except aeronautical mobile (R)</u>
<u>5.AAA</u></td></tr>
</table>

ADD – Example footnote

5.AAA Until 25 March 2018, the band 4 550-4 650 kHz is allocated to the fixed service on a primary basis, as well as to the following services: in Region 1 and 2 to the mobile except aeronautical mobile (R) service on a primary basis, in Region 3 to the mobile except aeronautical mobile service on a primary basis.

From 25 March 2018, the band 4 550-4 650 kHz is allocated to the fixed, mobile except aeronautical mobile (R) and broadcasting services on a primary basis.

MOD

5.129 Until 25 March 2018, ~~O~~on condition that harmful interference is not caused to the maritime mobile service, the frequencies in the bands 4 063-4 123 kHz and 4 130-4 438 kHz may be used exceptionally by stations in the fixed service communicating only within the boundary of the country in which they are located with a mean power not exceeding 50 W. From 25 March 2018, on condition that harmful interference is not caused to the maritime mobile service, the frequencies in the bands 4 063-4 123 kHz and 4 130-4 271 kHz and 4 351-4 438 kHz may be used exceptionally by stations in the fixed service communicating only within the boundary of the country in which they are located with a mean power not exceeding 50 W. (WRC-07)

ADD – Example footnote

5.MM1 Until 25 March 2018, the band 4 271-4 351 kHz is allocated to the maritime mobile service on a primary basis. From 25 March 2018, this band is allocated to the fixed, mobile except aeronautical mobile (R) services on a primary basis.

5/1.13/7.5.2 Example regulatory text for Opinion 2 (§ 5/1.13/6.5)

3 230-5 003 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
4 063-4 ~~438~~271	MARITIME MOBILE 5.79A 5.109 5.110 5.130 5.131 5.132 5.128 5.129	
4 271-4 351	FIXED MOBILE except aeronautical mobile (R) 5.129 5.MM1	
4 351-4 438	MARITIME MOBILE 5.128 5.129	
4 438-4 ~~650~~550 FIXED MOBILE except aeronautical mobile (R)		**4 438-4 ~~650~~550** FIXED MOBILE except aeronautical mobile
4 550-4 650	BROADCASTING 5.VVV FIXED MOBILE except aeronautical mobile (R) 5.AAA	

ADD

5.VVV After 25 March 2018, the use of the broadcasting service in the frequency band 4 550-4 650 kHz shall be in accordance with Resolution **NNN (WRC-07)**.

*Note: Resolution **NNN (WRC-07)** should include regulatory and/or technical conditions for sharing broadcasting service with existing services including restrictions to transmitting power, geographical areas and operating time of transmitting broadcasting stations.*

ADD – Example footnote

5.AAA Until 25 March 2018, the band 4 550-4 650 kHz is allocated to the fixed service on a primary basis, as well as the following services: in Region 1 and 2 to the mobile except aeronautical mobile (R) service on a primary basis, in Region 3 to the mobile except aeronautical mobile service on a primary basis.

From 25 March 2018, the band 4 550-4 650 kHz is allocated to the fixed, mobile except aeronautical mobile (R) and broadcasting services on a primary basis.

MOD

5.129 Until 25 March 2018, ~~O~~on condition that harmful interference is not caused to the maritime mobile service, the frequencies in the bands 4 063-4 123 kHz and 4 130-4 438 kHz may be used exceptionally by stations in the fixed service communicating only within the boundary of the country in which they are located with a mean power not exceeding 50 W. From 25 March 2018, on condition that harmful interference is not caused to the maritime mobile service, the frequencies in the bands 4 063-4 123 kHz and 4 130-4 271 kHz and 4 351-4 438 kHz may be used exceptionally by stations in the fixed service communicating only within the boundary of the country in which they are located with a mean power not exceeding 50 W.

ADD – Example footnote

5.MM1 Until 25 March 2018, the band 4 271-4 351 kHz is allocated to the maritime mobile service on a primary basis. From 25 March 2018, this band is allocated to the fixed, mobile except aeronautical mobile (R) services on a primary basis.

5/1.13/7.6 Regulatory and procedural considerations for Method 6 (Issue E)

5 003-7 450 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
5 250-5 ~~450~~260	FIXED MOBILE except aeronautical mobile	
5 260-5-410	FIXED MOBILE except aeronautical mobile Amateur	
5 410-5 450	FIXED MOBILE except aeronautical mobile	

5/1.13/7.7 Regulatory and procedural considerations for Method 7 (Issue E)

5 003-7 450 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
7 000-7 100	AMATEUR AMATEUR-SATELLITE 5.140 5.141 5.141A	
7 100-7 ~~200~~300	AMATEUR 5.141A 5.141B 5.141C 5.142	
~~**7 200-7 300**~~ ~~BROADCASTING~~	~~**7 200-7 300**~~ ~~AMATEUR~~ ~~5.142~~	~~**7 200-7 300**~~ ~~BROADCASTING~~
7 300-7 400	BROADCASTING 5.134 5.143 5.143A 5.143B 5.143C 5.143D	

MOD

5.142 Until 29 March 2009, the use of the band 7 100-7 300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3. ~~After 29 March 2009 the use of the band 7 200-7 300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3.~~ (WRC-0~~3~~7)

Agenda item 1.14

"to review the operational procedures and requirements of the Global Maritime Distress and Safety System (GMDSS) and other related provisions of the Radio Regulations, taking into account Resolutions 331 (Rev.WRC-03) and 342 (Rev.WRC-2000) and the continued transition to the GMDSS, the experience since its introduction, and the needs of all classes of ships"

Executive summary

Issue A

The implementation of GMDSS was expected to lead to the deletion of RR Appendix **13**. However, some provisions of RR Appendix **13** are still applicable and those provisions need to be retained. The deletion of RR Appendix **13** requires consequent changes to RR Articles **30**, **31**, **32** and **33**. Appendix **13** can be accommodated in different ways but all solutions must take into account guaranteed interoperability between digital selective calling (DSC) equipped vessels and non-DSC equipped vessels. Consequent to the changes, Resolution **331 (Rev.WRC-03)** requires thorough revision.

The International Maritime Organisation has authorized the discontinuance of a 2 182 kHz watch for SOLAS (Safety of Life at Sea) vessels. However, since some administrations need to maintain a 2 182 kHz watch to satisfy domestic requirements, relevant regulatory procedures have been imbedded in a new resolution.

RR Appendix **16** contains the list of documents that ships are required to carry on board. It is largely based on the old distress and safety system and needs to be revised.

RR Appendix **18** requires revision to provide more capacity to meet the increasing spectrum demand and in particular respond to the needs of data communications.

RR Appendix **19** requires interim revision and referral for suppression to address emergency position-indicating radiobeacons operating on the carrier frequency 2 182 kHz.

The provisions regarding Morse telegraphy in RR Articles **51**, **52** and **57** are proposed to be suppressed.

One method to satisfy issue A of Agenda item 1.14 has been identified. The principle of the method is to remove from the Radio Regulations a number of issues relating to the old distress and safety system, in particular RR Appendix **13**, and make a number of consequential changes.

Issue B

Planning for new technologies requires careful study of RR Appendix **18** and review of existing frequency allocations. In this work, specific modifications of RR Article **5** to provide protection for channel 70, in the same manner as channel 16 is currently protected, and satellite detection of the automatic identification system are proposed.

One method to satisfy issue A of Agenda item 1.14 has been identified.

Resolution 331 (Rev.WRC-03) – Transition to the Global Maritime Distress and Safety System (GMDSS)

5/1.14/1 Issue A – Transition to GMDSS

5/1.14/1.1 Background

The implementation of GMDSS was expected to lead to the deletion of RR Appendix **13**. However, some provisions of RR Appendix **13** are still applicable and need to be retained, and possibly rewritten for non-SOLAS vessels that are not subject to the GMDSS carriage requirements of the International Convention for the Safety of Life at Sea (SOLAS) and in particular the carriage of digital selective calling (DSC). Also, as GMDSS is the worldwide distress alerting system there are applicable lessons learned and changes to incorporate in Chapters **VII** and **IX** and applicable RR.

The distress relay procedures in the RR and the DSC procedures contained in the recently revised Recommendations ITU-R M.493-11 and ITU-R M.541-9 contain some inconsistencies that require revision of RR Article **32**.

The decisions under this agenda item should provide worldwide maritime safety system coordination to promote safety of life at sea in conjunction with International Maritime Organization (IMO) circulars and directives.

A number of texts in the RR are directly linked with the maritime distress and safety systems. These texts also need to be revised.

In addition, the 121.5 MHz alerting function through the COSPAS-SARSAT satellite system and Inmarsat E service are being discontinued.

5/1.14/1.2 Analysis of the situation

Procedures of distress and safety communications, in particular Chapter **VII**, reflect current revisions of the recommendations and lessons learned. Suppression of RR Appendix **13** can be accommodated in different ways but all solutions have to take into account the interoperability between DSC equipped vessels and non-DSC equipped vessels. Interoperability is required to maintain safety-of-life at sea until the maritime community has fully transitioned to the GMDSS. In accordance with IMO requirements, GMDSS ships are obliged to maintain continuous listening watch on VHF channel 16 (156.8 MHz) with a view to provide communications between SOLAS and non-SOLAS ships. All non-SOLAS vessels are encouraged to make use of GMDSS techniques as soon as possible.

The IMO has authorized the discontinuance of a 2 182 kHz watch for SOLAS vessels. It is necessary for some countries to maintain a 2 182 kHz watch in recognition of their continuing domestic requirements regarding non-SOLAS vessels outside of VHF range for the foreseeable future.

RR Appendix **16** contains the list of documents that ships are required to carry on board. It is largely based on the old distress and safety system and needs to be revised.

Resolution 342 (Rev.WRC-2000) – New technologies to provide improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service

5/1.14/2 Issue B – New technologies for maritime VHF

"*invites ITU-R*

to finalize the following studies:

a) identify the future requirements of the maritime mobile service;

b) identify suitable technical characteristics of the system or interoperable systems to replace existing technology;

c) identify necessary modifications to the Table of frequencies contained in Appendix **18**;

d) recommend a transition plan for the introduction of new technologies;

e) recommend how new technologies can be introduced while ensuring compliance with the distress and safety requirements."

5/1.14/2.1 Background

Resolution **342 (Rev.WRC-2000)** calls for the review of RR Appendix **18**, with the goal of accommodating new VHF technology in the 156-174 MHz band. WRC-03 modified RR Appendix **18**, including the addition of note *o)*, to permit the possible use, on a voluntary basis, of various channels or bands created by the conversion of some duplex channels to simplex channels, for the initial testing and the possible future introduction of new technologies. The future role of public correspondence VHF channels should also be re-evaluated based on current worldwide use of public correspondence coast stations. This item also promotes the efficient use of the VHF maritime band, and accommodates new VHF technology in this band.

Considering k) of Resolution **342 (Rev.WRC-2000)** addresses the AIS. AIS is an international standard for ship-to-ship, ship-to-shore and shore-to-ship communication of information, including vessel position, speed, course, destination and other data defined by Recommendation ITU-R M.1371-2. AIS was originally designed to enhance navigation safety, but its potential as a prime contributor to security quickly became apparent. AIS provides an effective means to monitor the total global marine environment that could affect the security, safety, economy, or environment of an Administration. AIS may operate on frequencies as specified by RR Appendix **18** (footnote l) and by Recommendation ITU-R M.1371-2.

On 6 December 2000, the IMO amended Chapter V of the SOLAS Convention to include an implementation schedule for shipboard AIS carriage requirements. In 2002, in response to the needs of administrations to improve their security, the IMO accelerated the AIS carriage requirements schedule from a phased approach ending in 2008, to require all vessels over 300 gross tonnage on international voyages to carry AIS equipment by 31 December 2004.

Some administrations are developing additional new technologies to detect AIS transmissions on ships of vessel identification and location, for experimental purposes and purposes of security.

5/1.14/2.2 Summary of technical and operational studies and relevant ITU-R Recommendations

Relevant ITU-R Recommendations and Reports: ITU-R M.541-9, ITU-R M.493-11, ITU-R M.489-2, ITU-R M.585-3, ITU-R M.822-1, ITU-R M.1084-4, ITU-R M.1371-2, Report ITU-R M.2084.

The diminished demand for public correspondence coast stations is apparent. The further introduction of digital radio telephony systems into this band could adopt suitably modified land mobile technology into a worldwide interoperable standard. When such radio telephony technology is available, consequential revisions of RR Appendix **18** are needed in a future conference to reflect new technologies.

Concerning new digital data services in the maritime VHF band, such technology is now available. A draft new Recommendation ITU-R M.[VHF-DATA] (8B/559 Annex 12) is being prepared to support the agenda for WRC-07. This technology will introduce the use of a continuous band, i.e. up to 225 kHz bandwidth.

Until such time the congestion on maritime VHF channels can be relieved using analogue technology, e.g. 12.5 kHz channel spacing. The usage of data transmissions on maritime VHF channels should be facilitated. WRC-07 should revise RR Appendix **18** to reflect these needs.

Studies have been carried out by ITU-R in response to Resolution **342 (Rev.WRC-2000)**. Report ITU-R M.2084 addresses the subject of satellite detection of the two AIS channels currently in use. This Report introduces satellite detection of AIS as one means of accomplishing long range ship detection. The Report addresses its technical feasibility, examines satellite capacity under various conditions and examines possible methods for improving satellite capacity. The remaining portions of this Report are organized into eight subsections as follows:

1) operational and technical characteristics of AIS;
2) overview of satellite detection of AIS;
3) link budget analysis;
4) intra-system interference analysis;
5) compatibility with incumbent mobile systems;
6) techniques for improving performance;
7) sharing; and
8) summary.

5/1.14/3 Analysis of the results of studies

Issue A: Changes are needed to a number of Articles, Appendices, Resolutions, and Recommendations of the RR to remove obsolete texts, in particular in reference to RR Appendix **13**. Note: some elements of Appendix **13** are still needed.

Also RR Appendix **16** requires revision. Parts of that Appendix are outdated.

Issue B: RR Appendix **18** requires revision to provide more capacity to meet the increasing spectrum demand and in particular respond to the needs of data communications. A possible digital maritime VHF technology to replace the existing analogue voice communications should be accepted only after completion of a full study. Such commonly acceptable technology for voice is not likely to be available at the time of WRC-07. For digital data in the VHF bands, such technology is being deployed in some administrations.

5/1.14/4 Methods to satisfy the Agenda item

5/1.14/4.1 Issue A

Method for Issue A – Completing transition to GMDSS

Integration of the RR Appendix **13** VHF radiotelephony procedures into Chapter **VII**.

Transfer RR Appendix **13** radiotelephony procedures for 2 182 kHz into a new WRC Resolution. This will address the need to retain these provisions by Administrations having domestic requirements for distress communications with non-SOLAS vessels outside of VHF coverage areas.

Consequent to the changes in RR Articles **30**.**33** and other changes, Resolution **331 (Rev.WRC-03)** and Recommendation ITU-R M.541-9 require revision.

RR Articles **4**, **15**, **19**, **41**, **51**, **52** and **57**, contain references to RR Appendix **13**. Those references need to be suppressed or amended.

Resolution **18 (Mob-83)** contains references to RR Appendix **13**. Those references need to be suppressed or amended.

Recommendation **14 (Mob-87)** contains references to RR Appendix **13**. Those references need to be amended. Furthermore this Recommendation should be considered for suppression under WRC-07 Agenda item 4.

Suppression of RR Appendix **13**.

Suppression of RR Appendix **19**. The emergency position-indicating radio beacons PIRB operating on 2 182 kHz is no longer used.

Revision of RR Appendix **15**. Parts of the Appendix contain references to RR Appendix **13**. Those references need to be suppressed or amended.

Revision of RR Appendix **16**. Parts of the Appendix are outdated (e.g. ships using Morse telegraphy). Some other parts of the Appendix are still relevant but contain requirements that cannot be justified with the ships' operational needs.

Revision of RR Appendix **17**. Parts of the Appendix contain references to RR Appendix **13**. Those references need to be suppressed or amended.

Revision of RR Appendix **18**. Parts of the Appendix contain references to RR Appendix **13**. Those references need to be suppressed or amended.

Revision of RR Article **5**. With a view to providing protection of VHF Channel 70.

Revision of RR Article **19**. With a view to updating the formation of call signs.

Revision of RR Article **5** and RR Article **34**. Make appropriate regulatory changes as a consequence of the discontinuation of the 121.5 MHz (1 January 2009) alerting function and Inmarsat E (1 December 2006).

5/1.14/4.2 Issue B

Method for Issue B – New technologies for maritime VHF

Revision of RR Appendix **18** with a view to:

– Emphasize the use of 12.5 kHz channel spacing for voice communication and frequency selection that does not put constraints on the facilitation of data services;

– Facilitate the split of two-frequency channels into one-frequency channels;

– Provide for a channel numbering scheme;

– Assist the introduction of data services on RR Appendix **18** channels.

Revision to RR Article **5** with a view to:

– Provide for satellite detection of AIS messages.

5/1.14/5 Regulatory and procedural considerations

5/1.14/5.1 Issue A

Method for Issue A

SUP

APPENDIX 13

SUP

APPENDIX 19

MOD

ARTICLE 5

MOD

5.79A When establishing coast stations in the NAVTEX service on the frequencies 490 kHz, 518 kHz and 4 209.5 kHz, administrations are strongly recommended to coordinate the operating characteristics in accordance with the procedures of the International Maritime Organization (IMO) (see Resolution **339 (Rev.WRC-~~97~~03)**)~~*~~. (WRC-~~97~~07)

MOD

5.82 In the maritime mobile service, the frequency 490 kHz is~~, from the date of full implementation of the GMDSS (see Resolution **331 (Rev.WRC-97)**)*~~, to be used exclusively for the transmission by coast stations of navigational and meteorological warnings and urgent information to ships, by means of narrow-band direct-printing telegraphy. The conditions for use of the frequency 490 kHz are prescribed in Articles **31** and **52**. In using the band 415-495 kHz for the aeronautical radionavigation service, administrations are requested to ensure that no harmful interference is caused to the frequency 490 kHz. (WRC-~~97~~07)

MOD

5.83 The frequency 500 kHz is an international distress and calling frequency for Morse radiotelegraphy. The conditions for its use are prescribed in Articles **31** and **52**~~, and in Appendix **13**~~.

MOD

5.84 The conditions for the use of the frequency 518 kHz by the maritime mobile service are prescribed in Articles **31** and **52**~~ and in Appendix **13**~~. (WRC-~~97~~07)

MOD

5.108 The carrier frequency 2 182 kHz is an international distress and calling frequency for radiotelephony. The conditions for the use of the band 2 173.5-2 190.5 kHz are prescribed in Articles **31** and **52**~~ and in Appendix **13**~~.

MOD

5.111 The carrier frequencies 2 182 kHz, 3 023 kHz, 5 680 kHz, 8 364 kHz and the frequencies 121.5 MHz, 156.525 MHz, 156.8 MHz and 243 MHz may also be used, in accordance with the procedures in force for terrestrial radiocommunication services, for search and rescue operations concerning manned space vehicles. The conditions for the use of the frequencies are prescribed in Article **31**~~ and in Appendix **13**~~.

The same applies to the frequencies 10 003 kHz, 14 993 kHz and 19 993 kHz, but in each of these cases emissions must be confined in a band of ±3 kHz about the frequency.

~~* *Note by the Secretariat:* This Resolution was revised by WRC-03.~~

MOD

5.115 The carrier (reference) frequencies 3 023 kHz and 5 680 kHz may also be used, in accordance with Article **31**~~ and Appendix **13**~~ by stations of the maritime mobile service engaged in coordinated search and rescue operations.

MOD

5.130 The conditions for the use of the carrier frequencies 4 125 kHz and 6 215 kHz are prescribed in Articles **31** and **52**~~ and in Appendix **13**~~.

MOD

5.145 The conditions for the use of the carrier frequencies 8 291 kHz, 12 290 kHz and 16 420 kHz are prescribed in Articles **31** and **52**~~ and in Appendix **13**~~.

SUP

5.199

MOD

5.200 In the band 117.975-136 MHz, the frequency 121.5 MHz is the aeronautical emergency frequency and, where required, the frequency 123.1 MHz is the aeronautical frequency auxiliary to 121.5 MHz. Mobile stations of the maritime mobile service may communicate on these frequencies under the conditions laid down in Article **31**~~ and Appendix **13**~~ for distress and safety purposes with stations of the aeronautical mobile service.

Editorial Note: Two options concerning frequency band 150.05-174 MHz are proposed.

Option 1 includes modification of the Table of Frequency Allocations, suppression of footnote 5.227, and addition of footnotes 5.226bis and 5.AAA.

Option 2 includes modification of the Table of Frequency Allocations, noting suppression of footnote 5.227, addition of footnote 5.AAA, and a modification of footnote 5.226.

Option 1

MOD

148-223 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
150.05-153 FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149	**150.05-156.~~7625~~4875** FIXED MOBILE 5.225 5.226 ~~5.227~~	
153-154 FIXED MOBILE except aeronautical mobile (R) Meteorological Aids		
154-156.~~7625~~4875 FIXED MOBILE except aeronautical mobile (R) 5.226 ~~5.227~~		
156.4875-156.5625	MARITIME MOBILE (distress and calling via DSC) 5.111 5.226 5.226*bis*	
~~154~~156.5625-156.7625 FIXED MOBILE except aeronautical mobile (R) 5.226 ~~5.227~~	**~~154~~156.5625-156.7625** FIXED MOBILE 5.225 5.226 ~~5.227~~	
156.7625-156.8375	MARITIME MOBILE (distress and calling) 5.111 5.226	
156.8375-174 FIXED MOBILE except aeronautical mobile 5.226 5.229 5.AAA	**156.8375-174** FIXED MOBILE 5.226 5.230 5.231 5.232 5.AAA	
...		

MOD

5.226 The frequency 156.8 MHz is the international distress, safety and calling frequency for the maritime mobile VHF radiotelephone service. The conditions for the use of this frequency are contained in Article **31** and Appendix **18** ~~and Appendix **13**~~.

The frequency 156.525 MHz is the international distress, safety and calling frequency for the maritime mobile VHF radiotelephone service using digital selective calling (DSC). The conditions for the use of this frequency are contained in Articles **31** and **52**, and Appendix **18**.

In the bands 156-156.~~7625~~4875 MHz, 156.5625-156.7625 MHz, 156.8375-157.45 MHz, 160.6-160.975 MHz and 161.475-162.05 MHz, each administration shall give priority to the maritime mobile service on only such frequencies as are assigned to stations of the maritime mobile service by the administration (see Articles **31** and **52**, and Appendix ~~**13**~~**18**).

Any use of frequencies in these bands by stations of other services to which they are allocated should be avoided in areas where such use might cause harmful interference to the maritime mobile VHF radiocommunication service.

However, the frequency 156.8 MHz and the frequency bands in which priority is given to the maritime mobile service may be used for radiocommunications on inland waterways subject to agreement between interested and affected administrations and taking into account current frequency usage and existing agreements.

ADD

5.226*bis* *Additional allocation:* in countries XXX, YYY, and ZZZ the bands 156.4875-156.5125 MHz and 156.5375-156.5625 MHz are also allocated to the fixed and land mobile services on a primary basis.

SUP

5.227

ADD

5.AAA The bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz are also allocated to the mobile-satellite service (Earth-to-space) on a secondary basis for the reception of the automatic identification system (AIS) emissions.

Option 2

148-223 MHz

<table>
<tr><th colspan="3">Allocation to services</th></tr>
<tr><th>Region 1</th><th>Region 2</th><th>Region 3</th></tr>
<tr><td colspan="3">…</td></tr>
<tr><td>149.9-150.05</td><td colspan="2">MOBILE-SATELLITE (Earth-to-space) 5.209 5.224A
RADIONAVIGATION-SATELLITE 5.224B
5.220 5.222 5.223</td></tr>
<tr><td>150.05-153
FIXED
MOBILE except aeronautical mobile
RADIO ASTRONOMY
5.149</td><td colspan="2" rowspan="3">150.05-156.7625
FIXED
MOBILE
5.225 5.226 ~~5.227~~</td></tr>
<tr><td>153-154
FIXED
MOBILE except aeronautical mobile (R)
Meteorological Aids</td></tr>
<tr><td>154-156.7625
FIXED
MOBILE except aeronautical mobile (R)
5.226 ~~5.227~~</td></tr>
<tr><td>156.7625-156.8375</td><td colspan="2">MARITIME MOBILE (distress and calling)
5.111 5.226</td></tr>
<tr><td>156.8375-174
FIXED
MOBILE except aeronautical mobile
5.226 5.229 5.AAA</td><td colspan="2">156.8375-174
FIXED
MOBILE
5.226 5.230 5.231 5.232 5.AAA</td></tr>
<tr><td colspan="3">…</td></tr>
</table>

MOD

5.226 The frequency 156.8 MHz is the international distress, safety and calling frequency for the maritime mobile VHF radiotelephone service. The conditions for the use of this frequency are contained in Article **31** and Appendix **18** ~~and Appendix **13**~~.

The frequency 156.525 MHz is the international distress, safety and calling frequency for the maritime mobile VHF radiotelephone service using digital selective calling (DSC). The conditions for the use of this frequency are contained in Articles **31** and **52**, and Appendix **18**.

In the bands 156-156.~~7625~~4875 MHz, 156.5625-156.7625 MHz, 156.8375-157.45 MHz, 160.6-160.975 MHz and 161.475-162.05 MHz, each administration shall give priority to the maritime mobile service on only such frequencies as are assigned to stations of the maritime mobile service by the administration (see Articles **31** and **52**, and Appendix ~~**13**~~**18**).

The frequency band 156.4875-156.5625 MHz is to be used exclusively by the maritime mobile service. In countries XXX, YYY, and ZZZ the bands 156.4875-156.5125 MHz and 156.5375-156.5625 MHz may also be used by the fixed and land mobile services on a primary basis.

Any use of frequencies in these bands by stations of other services to which they are allocated should be avoided in areas where such use might cause harmful interference to the maritime mobile VHF radiocommunication service.

However, the frequency 156.8 MHz and the frequency bands in which priority is given to the maritime mobile service may be used for radiocommunications on inland waterways subject to agreement between interested and affected administrations and taking into account current frequency usage and existing agreements.

SUP

5.227

ADD

5.AAA The bands 161.9625-161.9875 MHz and 162.0125-162.0375 MHz are also allocated to the mobile-satellite service (Earth-to-space) on a secondary basis for the reception of the automatic identification system (AIS) emissions.

Editorial Note: Modifications to footnotes 5.256, 5.266 and 5.287 listed below are not related to the band 150.05-174 MHz and are common for Option 1 and Option 2.

MOD

5.256 The frequency 243 MHz is the frequency in this band for use by survival craft stations and equipment used for survival purposes~~ (see Appendix **13**)~~.

MOD

5.266 The use of the band 406-406.1 MHz by the mobile-satellite service is limited to low power satellite emergency position-indicating radiobeacons (see also Article **31**~~ and Appendix **13**~~).

MOD

5.287 In the maritime mobile service, the frequencies 457.525 MHz, 457.550 MHz, 457.575 MHz, 467.525 MHz, 467.550 MHz and 467.575 MHz may be used by on-board communication stations. Where needed, equipment designed for 12.5 kHz channel spacing using also the additional frequencies 457.5375 MHz, 457.5625 MHz, 467.5375 MHz and 467.5625 MHz may be introduced for on-board communications. The use of these frequencies in territorial waters may be subject to the national regulations of the administration concerned. The characteristics of the equipment used shall conform to those specified in Recommendation ITU-R M.1174~~ (see Resolution **341 (WRC-97)***)~~. (WRC-~~97~~07)"

MOD

ARTICLE 15

MOD

15.8 § 4 Special consideration shall be given to avoiding interference on distress and safety frequencies, those related to distress and safety identified in Article **31**~~ and Appendix **13**,~~ and those related to safety and regularity of flight identified in Appendix **27**. (WRC-~~2000~~07)

MOD

15.28 § 20 Recognizing that transmissions on distress and safety frequencies and frequencies used for the safety and regularity of flight (see Article **31**~~, Appendix **13**~~ and Appendix **27**) require absolute international protection and that the elimination of harmful interference to such transmissions is imperative, administrations undertake to act immediately when their attention is drawn to any such harmful interference. (WRC-~~2000~~07)

MOD

ARTICLE 19

MOD

19.55 § 24 1)

– two characters and two letters, *or*

– two characters, two letters and one digit (other than the digits 0 or 1), *or*

– two characters (provided that the second is a letter) followed by four digits (other than the digits 0 or 1 in cases where they immediately follow a letter), *or*

– two characters and one letter followed by four digits (other than the digits 0 or 1 in cases where they immediately follow a letter).

~~* *Note by the Secretariat:* This Resolution was abrogated by WRC-03.~~

SUP

19.56

MOD

19.76 4) *Emergency position-indicating radiobeacon stations*

When speech transmission is used~~ (see Appendix **13**)~~:

– the name and/or the call sign of the parent ship to which the radiobeacon belongs.

MOD

ARTICLE 30

MOD

30.1 § 1 This Chapter contains the provisions for the operational use of the global maritime distress and safety system (GMDSS), ~~which is fully defined~~whose functional requirements, system elements and equipment carriage requirements are set forth in the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended.~~ Distress, urgency and safety transmissions may also be made, using Morse telegraphy or radiotelephony techniques, in accordance with the provisions of Appendix **13** and relevant ITU-R Recommendations. Stations of the maritime mobile service, when using frequencies and techniques in conformity with Appendix **13**, shall comply with the appropriate provisions of that Appendix.~~ This Chapter also contains provisions for initiating distress, urgency and safety communications by means of radiotelephony on the frequency 156.8 MHz (VHF channel 16).

MOD

30.3 § 3 No provision of these Regulations prevents the use by stations on board aircraft, ships engaged in search and rescue operations, land stations, coast stations or coast earth stations, in exceptional circumstances, of any means at their disposal to assist a mobile station or a mobile earth station in distress (see also Nos. **4.9** and **4.16**).

MOD

30.4 § 4 The provisions specified in this Chapter are obligatory~~ (see Resolution **331 (Rev.WRC-97)**[*])~~ in the maritime mobile service and the maritime mobile-satellite service for all stations using the frequencies and techniques prescribed for the functions set out herein (see also No. **30.5**).~~ However, stations of the maritime mobile service, when fitted with equipment used by stations operating in conformity with Appendix **13**, shall comply with the appropriate provisions of that Appendix.~~

~~[*] *Note by the Secretariat:* This Resolution was revised by WRC-03.~~

ADD

30.11*bis* Aircraft, when conducting search and rescue operations are also permitted to operate DSC equipment on the VHF DSC frequency 156.525 MHz, and AIS equipment on the AIS frequencies 161.975 MHz and 162.025 MHz.

MOD

ARTICLE 31

MOD

31.1 § 1 The frequencies to be used for the transmission of distress and safety information under the GMDSS are contained in Appendix **15**. In addition to the frequencies listed in Appendix **15**, ship stations and coast stations should use other appropriate frequencies for the transmission of safety messages and general radiocommunications to and from shore-based radio systems or networks.

MOD

31.2 § 2 Any emission causing harmful interference to distress and safety communications on any of the discrete frequencies identified in Appendi~~ces~~x ~~**13** and~~ **15** is prohibited.

MOD

31.17 § 8 1) Ship stations, where so equipped, shall, while at sea, maintain an automatic digital selective calling watch on the appropriate distress and safety calling frequencies in the frequency bands in which they are operating. Ship stations, where so equipped, shall also maintain watch on the appropriate frequencies for the automatic reception of transmissions of meteorological and navigational warnings and other urgent information to ships. ~~However, ship stations shall also continue to apply the appropriate watch-keeping provisions of Appendix **13** (see Resolution **331 (Rev.WRC-97)**[*]).~~

MOD

31.18 2) Ship stations complying with the provisions of this Chapter should, where practicable, maintain a watch on the frequency 156.~~650~~800 MHz ~~for communications related to the safety of navigation~~(VHF channel 16).

~~[*] *Note by the Secretariat:* This Resolution was revised by WRC-03.~~

MOD

ARTICLE 32

MOD

32.1 § 1 Distress~~ and safety~~ communications rely on the use of terrestrial MF, HF and VHF radiocommunications and communications using satellite techniques. Distress communications shall have absolute priority over all other transmissions.

MOD

32.2 § 2 1) The distress alert (see No. **32.9**) shall be sent through a satellite either with absolute priority in general communication channels~~ or~~, on exclusive distress and safety frequencies reserved for satellite EPIRBs in the Earth-to-space direction or~~, alternatively,~~ on the distress and safety frequencies designated in the MF, HF and VHF bands ~~using digital selective calling~~(see Appendix **15**).

MOD

32.4 § 3 All stations which receive a distress alert transmitted ~~by digital selective calling~~on the distress and safety frequencies in the MF, HF and VHF bands shall immediately cease any transmission capable of interfering with distress traffic and ~~shall continue watch until the call has been acknowledged~~prepare for subsequent distress traffic.

MOD

32.5 § 4 Calls using d~~D~~igital selective calling ~~shall be in accordance with the relevant ITU-R~~should use the technical structure and content set forth in the most recent version of Recommendations ITU-R M.493 and ITU-R M.541.

ADD

32.10B Administrations shall take practicable and necessary steps to ensure the avoidance of false distress alerts, including those transmitted inadvertently.

MOD

32.13 § 9 1) Ship-to-ship distress alerts are used to alert other ships in the vicinity of the ship in distress and are based on the use of digital selective calling in the VHF and MF bands. Additionally, the HF band may be used.

ADD

32.13A 2) In order to attract attention from as many ship stations as possible, ship stations equipped for making use of digital selective calling procedures may transmit a radiotelephony distress call and message on the frequency 156.8 MHz (VHF channel 16) immediately following the distress alert sent by digital selective calling on the frequency 156.525 MHz (VHF channel 70).

ADD

32.13B 3) Ship stations not equipped for making use of the digital selective calling procedures may initiate the distress communications by transmitting a radiotelephony distress call and message on the frequency 156.8 MHz (VHF channel 16). The radiotelephone distress procedure consists of the distress call and the distress message[2].

ADD

32.13C § 9A 1) The distress call sent on the frequency 156.8 MHz (VHF channel 16) shall be given in the following form:

– the distress signal MAYDAY, spoken three times;

– the words THIS IS;

– the name of the vessel in distress, spoken three times;

– the call sign or other identification;

– the MMSI (if the initial alert has been sent by DSC).

ADD

32.13D 2) The distress message which follows the distress call, shall be given in the following form:

– the distress signal MAYDAY;

– the name of the vessel in distress;

– the call sign or other identification;

– the MMSI (if the initial alert has been sent by DSC);

– the position given either as the latitude and longitude or with respect to a known geographical location;

– the nature of the distress;

– the kind of assistance required;

– any other useful information.

[2] **32.13B.1** It should be noted that there is a higher probability of successful reception of a distress message if the distress message is preceded by a DSC alert.

ADD

32.13E § 9B Digital selective calling procedures use a combination of automated functions and manual intervention to generate the appropriate distress call format in the most recent version of Recommendation ITU-R M.541. The distress alert sent by digital selective calling consists of one or more distress alert attempts in which a message format is transmitted identifying the station in distress, giving its last recorded position and, if entered, the nature of the distress. At MF and HF, distress alert attempts may be sent as a single frequency attempt or a multi-frequency attempt on up to six frequencies within one minute. At VHF, only single frequency call attempts are used. The distress alert will repeat automatically at random intervals, a few minutes apart, until an acknowledgement sent by digital selective calling is received.

MOD

32.15 2) The distress alert relay shall contain the identification of the mobile unit in distress, its position and all other information which might facilitate rescue.

B3 – Transmission of a distress alert relay by a station not itself in distress

MOD

32.16 § 11 A station in the mobile or mobile-satellite service which learns that a mobile unit is in distress (for example, by a radio call or by observation) shall initiate and transmit a distress alert ~~in any of the following cases~~relay on behalf of the mobile unit in distress once it has ascertained that any of the following circumstances apply:

MOD

32.17 *a)* ~~when the mobile unit in distress is not itself in a position to transmit the distress alert~~on receiving a distress call sent by radiotelephony on the frequency 156.8 MHz (VHF channel 16), which is not acknowledged by a coast station or another vessel within 5 minutes (see also No. **32.29A)**;

ADD

32.17A *b)* on receiving a distress alert on an HF channel, which is not acknowledged by a coast station within 5 minutes (see also No. **32.31**).

MOD

32.18 *~~b~~c)* ~~when~~on knowing that the mobile unit in distress is otherwise unable or incapable of participating in distress communications and the master or other person responsible for the mobile unit not in distress~~ or the person responsible for the land station~~ considers that further help is necessary.

MOD

32.19 § 12 1) ~~A station transmitting a distress alert relay in accordance with Nos. **32.16**, **32.17**, **32.18** and **32.31** shall indicate that it is not itself in distress~~The distress relay on behalf of a mobile unit in distress shall be sent in a form appropriate to the circumstances using either a MAYDAY relay by radiotelephony (see No. **32.19E**), an individually addressed distress relay call by digital selective calling (see No. **32.19B**) or a distress priority message through a ship earth station.

ADD

32.19A 2) A station transmitting a distress alert relay in accordance with Nos. **32.16** to **32.18** shall indicate that it is not itself in distress.

ADD

32.19B 3) A distress alert relay sent by digital selective calling should use the call format, as found in the most recent version of Recommendations ITU-R M.493 and ITU-R M.541 and preferably be addressed to an individual coast station or rescue coordination centre[5new1].

ADD

[5new1] **32.19B.1** Vessels making a distress relay call should ensure that a suitable coast station or rescue coordination centre is informed of any original distress communications.

ADD

32.19C 4) However, a ship shall not transmit a distress relay alert to all ships by digital selective calling on the VHF or MF distress frequencies following receipt of a distress alert sent by digital selective calling by the ship in distress.

ADD

32.19D 5) When an aural watch is being maintained on shore and reliable ship-to-shore communications can be established by radiotelephony, a distress relay call shall be sent by radiotelephony and addressed to the relevant coast station or rescue coordination centre[5new2] on the appropriate frequency.

ADD

[5new2] **32.19D.1** Vessels making a distress relay call should ensure that a suitable coast station or rescue coordination centre is informed of any original distress communications.

ADD

32.19E 6) The distress relay call sent by radiotelephony shall be given in the following form:

– the distress signal MAYDAY RELAY, spoken three times;
– ALL STATIONS or coast station name spoken three times;
– the words THIS IS;
– the name of the relaying station, spoken three times;
– the call sign or other identification of the relaying station;
– the MMSI (if the initial alert has been sent by DSC) of the relaying station (the vessel not in distress).

ADD

32.19F 7) This call shall be followed by a distress message which shall, as far as possible, repeat the information[5new3] contained in the original distress alert.

ADD

[5new3] **32.19F.1** If the station in distress cannot be identified, then it will be necessary to originate the distress message as well, using, for example, terms such as “Unidentified trawler” or “Unidentified helicopter” refer to the mobile unit in distress.

ADD

32.19G 8) When no aural watch is being maintained on shore, or there are other difficulties in establishing reliable ship-to-shore communications by radiotelephony, an appropriate coast station or rescue coordination centre may be contacted by sending an individual distress relay call by digital selective calling addressed solely to that station and using the appropriate call formats.

ADD

32.19H 9) In the event of continued failure to contact a coast station or rescue coordination centre directly then it may be appropriate to send a MAYDAY relay by radiotelephony addressed to all ships or to all ships in a certain geographical area. See also No. **32.19C**.

MOD

32.21 § 13 1) ~~Acknowledgement by digital selective calling of receipt of a distress alert in the terrestrial services shall be in accordance with relevant ITU-R Recommendations (see Resolution **27 (Rev.WRC-03)**)~~Acknowledgement of receipt of a distress alert, including a distress alert relay shall be made in the manner appropriate to the method of transmission of the alert and within the time-scale appropriate to the role of the station in receipt of the alert. Acknowledgement by satellite shall be sent immediately.

ADD

32.21A 2) When acknowledging receipt of a distress alert sent by digital selective calling[5new4], the acknowledgement in the terrestrial services shall be made by digital selective calling, radiotelephony or narrow-band direct-printing telegraphy as appropriate to the circumstances, on the associated distress and safety frequency in the same band in which the distress alert was received, taking due account of the directions given in the most recent versions of Recommendations ITU-R M.493 and ITU-R M.541.

ADD

[5new4] **32.21A.1** In order to ensure that no unnecessary delay occurs before the shore based authorities become aware of a distress incident, the acknowledgement by digital selective calling to a distress alert sent by digital selective calling shall normally only be made by a coast station or a rescue coordination centre, as an acknowledgement by digital selective calling will cancel any further automated repetition of the distress alert using digital selective calling.

ADD

32.21B Acknowledgement by digital selective calling in receipt of a distress alert sent by digital selective calling addressed to stations in the maritime mobile services shall be addressed to the same station as the distress alert[5new5].

ADD

[5new5] **32.21B.1** In order to ensure that no unnecessary delay occurs before the shore based authorities become aware of a distress incident, the acknowledgement by digital selective calling to a distress alert sent by digital selective calling shall normally only be made by a coast station or rescue coordination centre, as an acknowledgement by digital selective calling will cancel any further automated repetition of the distress alert using digital selective calling.

SUP

32.22

MOD

32.23 § 15 1) ~~Acknowledgement by radiotelephony of receipt of a distress alert from a ship station or a ship earth station shall be given in the following form~~When acknowledging by radiotelephony the receipt of a distress alert from a ship station or a ship earth station, the acknowledgement shall be given in the following form:

- the distress signal MAYDAY;
- the name followed by the call sign or the MMSI or other identification of the station sending the distress message~~, spoken three times~~;
- the words THIS IS ~~(or DE spoken as DELTA ECHO in case of language difficulties)~~;
- the name and call sign or other identification of the station acknowledging receipt~~, spoken three times~~;
- the word RECEIVED ~~(or RRR spoken as ROMEO ROMEO ROMEO in case of language difficulties)~~;
- the distress signal MAYDAY.

MOD

32.24 2) ~~The acknowledgement by direct-printing telegraphy of receipt of a distress alert from a ship station shall be given in the following form~~When acknowledging by narrow-band direct printing telegraphy the receipt of a distress alert from a ship station, the acknowledgement shall be given in the following form:

- the distress signal MAYDAY;
- the call sign or other identification of the station sending the distress alert;
- the word DE;
- the call sign or other identification of the station acknowledging receipt of the distress alert;
- the signal RRR;
- the distress signal MAYDAY.

SUP

32.25

MOD

32.26 § 17 Coast stations and the appropriate coast earth stations in receipt of distress alerts shall ensure that they are routed as soon as possible to a rescue coordination centre. In addition r~~R~~eceipt of a distress alert is to be acknowledged as soon as possible by a coast station, or by a rescue coordination centre via a coast station or an appropriate coast earth station. A shore-to-ship distress alert relay (see Nos. **32.14** and **32.15**) shall also be made when the method of receipt warrants a broadcast alert to shipping or when the circumstances of the distress incident indicate that further help is necessary.

MOD

32.27 § 18 A coast station using digital selective calling to acknowledge a distress ~~call~~alert shall transmit the acknowledgement on the distress calling frequency on which the ~~call~~alert was received and should address it to all ships. The acknowledgement shall include the identification of the ship whose distress ~~call~~alert is being acknowledged.

MOD

32.29 2) In areas where reliable communications with one or more coast stations are practicable, ship stations in receipt of a distress alert from another vessel should defer acknowledgement for a short interval so that a coast station may acknowledge receipt ~~may be acknowledged by a coast station~~in the first instance.

ADD

32.29A 3) Ship stations in receipt of a distress call sent by radiotelephony on the frequency 156.8 MHz (VHF channel 16) shall, if the call is not acknowledged by a coast station or another vessel within 5 minutes, acknowledge receipt to the vessel in distress and use any means available to relay the distress alert to an appropriate coast station or coast earth station (see also Nos. **32.16** to **32.19F**).

MOD

32.30 § 20 1) Ship stations operating in areas where reliable communications with a coast station are not practicable which receive a distress alert from a ship station which is, beyond doubt, in their vicinity, shall, as soon as possible and if appropriately equipped, acknowledge receipt to the vessel in distress and inform a rescue coordination centre through a coast station or coast earth station (see also Nos. **32.~~18~~16 to 32.19H**).

MOD

32.31 2) However, in order to avoid making unnecessary or confusing transmissions in response a ship station receiving an HF distress alert which may be at a considerable distance from the incident, shall not acknowledge it but shall observe the provisions of Nos. **32.36** to **32.38**, and shall, if the alert is not acknowledged by a coast station within ~~3~~5 minutes, relay the distress alert, but only to an appropriate coast station or coast earth station (see also Nos. **32.16** to **32.19H**).

MOD

32.32 § 21 A ship station acknowledging receipt of a distress alert sent by digital selective calling should, in accordance with No. **32.29** or No. **32.30** ~~should~~:

MOD

32.33 *a)* in the first instance, acknowledge receipt of the alert by using radiotelephony on the distress and safety traffic frequency in the band used for the alert, taking into account any potential instructions issued by a responding coast station;

ADD

32.34A § 21A However, unless instructed to do so by a coast station or a rescue coordination centre, a ship station may only send an acknowledgement by digital selective calling in the event that:

a) no acknowledgement by digital selective calling from a coast station has been observed; and

b) no other communication by radiotelephony or narrow-band direct-printing telegraphy to or from the vessel in distress has been observed; and

c) at least 5 minutes have elapsed and the distress alert by digital selective calling has been repeated (see No. **32.21A.1**).

MOD

32.45 § 28 1) The ~~R~~rescue ~~C~~coordination ~~C~~centre responsible for controlling a search and rescue operation shall also coordinate the distress traffic relating to the incident or may appoint another station to do so.

MOD

32.51 § 31 When distress traffic has ceased on frequencies which have been used for distress traffic, the station~~rescue coordination centre~~ controlling the~~a~~ search and rescue operation shall initiate a message for transmission on these frequencies indicating that distress traffic has finished.

MOD

32.52 § 32 1) In radiotelephony, the message referred to in No. **32.51** consists of:

- the distress signal MAYDAY;
- ~~the call "Hello all stations" or CQ (spoken as CHARLIE QUEBEC) spoken three times~~the call "ALL STATIONS", spoken three times;
- the words THIS IS ~~(or DE spoken as DELTA ECHO in the case of language difficulties)~~;
- the name of the station sending the message, spoken three times;
- the call sign or other identification of the station sending the message;
- the time of handing in of the message;
- ~~the name and call sign of the mobile station which was in distress~~the MMSI (if the initial alert has been sent by DSC), the name and the call sign of the mobile station which was in distress; and
- the words SEELONCE FEENEE pronounced as the French words "silence fini".

ADD

32.53A Cancellation of an inadvertent distress alert.

A station transmitting an inadvertent distress alert shall cancel the distress alert.

Immediately cancel the distress alert orally on the associated distress and safety frequency in the same band on which the "distress alert" was transmitted using the following procedure:

- All Stations All Stations All Stations;
- the words THIS IS;
- the name of the vessel, spoken three times;
- the call sign or other identification;
- the MMSI (if the initial alert has been sent by DSC);
- PLEASE CANCEL MY FALSE DISTRESS ALERT of time in UTC.

Monitor the same band on which the "distress alert" was transmitted and respond to any communications concerning that distress alert as appropriate.

If the initial alert has been sent by DSC, if the DSC equipment is capable, initiate a SELF CANCELLATION.

MOD

32.63 3) Locating signals may be transmitted in the following frequency bands:

117.975-136 MHz;

156-174 MHz;

406-406.1 MHz; and

~~1 645.5-1 646.5 MHz; and~~

9 200-9 500 MHz.

SUP

32.64

MOD

ARTICLE 33

Operational procedures for urgency and safety communications in the global maritime distress and safety system (GMDSS)

Section I – General

MOD

33.1 § 1 1) Urgency and safety communications include:

ADD

33.7A 2) Urgency communications shall have priority over all other communications, except distress.

ADD

33.7B 3) Safety communications shall have priority over all other communications, except distress and urgency.

MOD

33.8 § 2 1) In a terrestrial system, urgency communications consist of an announcement, transmitted using digital selective calling or radiotelephony, followed by the urgency message transmitted using radiotelephony or narrow-band direct-printing. ~~t~~The announcement of the urgency message shall be made on one or more of the distress and safety calling frequencies specified in Section I of Article **31** using either digital selective calling techniques and the urgency call format or, when appropriate, radiotelephony procedures and the urgency signal. Calls using digital selective calling should use the technical structure and content set forth in the most recent version of Recommendations ITU-R M.493 and ITU-R M.541. ~~A separate announcement need not be made if the urgency message is to be transmitted through the maritime mobile-satellite service~~.

ADD

33.8A 2) Ship stations not equipped for making use of digital selective calling procedures may announce an urgency message by transmitting the urgency signal by radiotelephony on the frequency 156.8 MHz (channel 16)[32.8A.1], while taking into account that other stations outside VHF range may not receive the announcement.

ADD

33.8A.1 it should be noted that there is a higher probability of successful reception of an urgency message if it is announced by DSC.

ADD

33.8B 3) In the maritime mobile service, urgency communications may be addressed either to all stations or to a particular station. When using digital selective calling techniques, the urgency announcement shall indicate which frequency is to be used to send the subsequent message and, in the case of a message to all stations, shall use the “All Ships” format setting.

ADD

33.8C 4) Urgency communications from a coast station may also be directed to a group of vessels or to vessels in a defined geographical area.

MOD

33.9 § 3 1) The urgency ~~signal and~~ message shall be transmitted on one or more of the distress and safety traffic frequencies specified in Section I of Article **31**~~, or via the maritime mobile-satellite service or on other frequencies used for this purpose~~.

ADD

33.9A 2) However, in the maritime mobile service, the message shall be transmitted on a working frequency:

a) in the case of a long message or a medical call; or

b) in areas of heavy traffic when the message is being repeated.

An indication to this effect shall be included in the announcement.

ADD

33.9B 3) In the maritime mobile-satellite service, a separate announcement does not need to be made before sending the urgency message. However, if available, the appropriate network priority access settings should be used for sending the message.

MOD

33.11 § 5 1) The urgency call format and the urgency signal indicate that the calling station has a very urgent message to transmit concerning the safety of a mobile unit or a person.

ADD

33.11A 2) Communications concerning medical advice may be preceded by the urgency signal. Mobile stations requiring medical advice may obtain it through any of the land stations shown in the List of Radiodetermination and Special Service Stations.

ADD

33.11B 3) Urgency communications to support search and rescue operations need not be preceded by the urgency signal.

MOD

33.12 § 6 1) ~~In radiotelephony, the urgency message shall be preceded by the urgency signal (see No. **33.10**), repeated three times, and the identification of the transmitting station.~~The urgency call consists of:

– the urgency signal PAN PAN, spoken three times;

– the name of the called station or “all stations”, spoken three times;

– the words THIS IS;

– the name of the station transmitting the urgency message, spoken three times;

– the call sign or any other identification;

– the MMSI (if the initial announcement has been sent by DSC).

Followed by the message or followed by the details of the channel to be used for the message in the case where a working channel is to be used.

In radiotelephony, on the selected working frequency, the urgency call and message consists of:

– the urgency signal PAN PAN, spoken three times;
– the name of the called station or "all stations", spoken three times;
– the words THIS IS;
– the name of the station transmitting the urgency message, spoken three times;
– the call sign or any other identification;
– the MMSI (if the initial announcement has been sent by DSC):
– the text of the urgency message.

MOD

33.14 § 7 1) The urgency call format or urgency signal shall be sent only on the authority of the ~~master or the~~ person responsible for the ~~mobile unit carrying the mobile station or mobile earth station~~ship, aircraft or other vehicle carrying the mobile station or the mobile earth station.

ADD

33.15A § 7A 1) Ship stations in receipt of an urgency announcement or call addressed to all stations shall not acknowledge.

ADD

33.15B 2) Ship stations in receipt of an urgency announcement or call of an urgency message shall monitor the frequency or channel indicated for the message for at least five minutes. If, at the end of the five minute monitoring period, no urgency message has been received, a coast station should, if possible, be notified of the missing message. Thereafter, normal working may be resumed.

ADD

33.15C 3) Coast and ship stations which are in communication on frequencies other than those used for the transmission of the urgency signal or the subsequent message may continue their normal work without interruption, provided that the urgency message is not addressed to them nor broadcast to all stations.

MOD

33.16 § 8 ~~When an urgency message which calls for action by the stations receiving the message has been transmitted, the station responsible for its transmission shall cancel it as soon as it knows that action is no longer necessary.~~The urgency cancellation consists of:

The urgency cancellation consists of:

- the urgency signal PAN PAN, spoken three times;
- “all stations”, spoken three times;
- the words THIS IS;
- the name of the station transmitting the urgency message, spoken three times;
- the call sign or any other identification;
- the MMSI (if the initial announcement has been sent by DSC):
- PLEASE CANCEL MY URGENCY MESSAGE of time in UTC.

MOD

33.20 § 11 1) For the purpose of announcing and identifying medical transports which are protected under the above-mentioned Conventions, the procedure of Section II of ~~this~~ Article **31** is used. The urgency signal shall be followed by the addition of the single word MEDICAL in narrow-band direct-printing and by the addition of the single word MAY-DEE-CAL pronounced as in French “médical”, in radiotelephony.

ADD

33.20A 2) When using digital selective calling techniques, the announcement on the appropriate Digital Selective Calling distress and safety frequencies shall always use the following call format:

- Format Specifier: “ALL SHIPS” on VHF, and geographical area on HF and MF;
- Category: “URGENCY”;
- Telecommand: “MEDICAL TRANSPORT”.

ADD

33.20B 3) Medical transports may use one or more of the distress and safety traffic frequencies specified in Section I of Article **31** for the purpose of self-identification and to establish communications. As soon as practicable, communications shall be transferred to an appropriate working frequency.

MOD

33.21 § 12 The use of the signals described in Nos. **33.20** and **33.20A** indicates that the message which follows concerns a protected medical transport. The message shall convey the following data:

SUP

33.28 and **33.29**

MOD

33.31 § 15 1) In a terrestrial system, safety communications consist of an announcement, transmitted using digital selective calling or radiotelephony, followed by the safety message transmitted using radiotelephony or narrow-band direct printing. ~~t~~The announcement of the safety message shall be made on one or more of the distress and safety calling frequencies specified in Section I of Article **31** using either digital selective calling techniques~~. A separate announcement need not be made if the message is to be transmitted through the maritime mobile-satellite service~~ and the safety call format or radiotelephony procedures and the safety signal.

MOD

33.31A 2) However, in order to avoid unnecessary loading of the distress and safety calling frequencies specified for use with digital selective calling techniques:

a) s~~S~~afety messages transmitted by coast stations in accordance with a predefined timetable should not be announced by digital selective calling techniques;

b) the radiotelephony procedures for announcing the transmission of a safety message should also be used when the message only concerns vessels sailing in the immediate area. (WRC-0~~3~~7)

ADD

33.31B 3) In addition, ship stations not equipped for making use of digital selective calling procedures may announce a safety message by transmitting the safety signal by radiotelephony. In such cases the announcement shall be made using the frequency 156.8 MHz (VHF channel 16), while taking into account that other stations outside VHF range may not receive the announcement.

ADD

33.31C 4) In the maritime mobile service, safety messages shall generally be addressed to all stations. In some cases, however, they may be addressed to a particular station. When using digital selective calling techniques, the safety announcement shall indicate which frequency is to be used to send the subsequent message and, in the case of a message to all stations, shall use the “All Ships” format setting.

MOD

33.32 § 16 1) In the maritime mobile service, the safety ~~signal and~~ message shall, where practicable, ~~normally~~ be transmitted on a working frequency in the same band(s) as used for the announcement. A suitable indication to this effect shall be made at the end of the announcement.~~one or more of the distress and safety traffic frequencies specified in Section I of Article 31, or via the maritime mobile-satellite service or on other frequencies used for this purpose.~~ In the case that no other option is practicable, the safety message may be sent by radiotelephony on the frequency 156.8 MHz (VHF channel 16).

ADD

33.32A 2) In the maritime mobile-satellite service, a separate announcement does not need to be made before sending the safety message. However, if available, the appropriate network priority access settings should be used for sending the message.

MOD

33.34 § 18 1) The safety call format or the safety signal indicates that the calling station has an important navigational or meteorological warning to transmit.

ADD

33.34A 2) Messages from ship stations containing information concerning the presence of cyclones shall be transmitted, with the least possible delay, to other mobile stations in the vicinity and to the appropriate authorities through a coast station, or through a rescue coordination centre via a coast station or an appropriate coast earth station. These transmissions shall be preceded by the safety signal.

ADD

33.34B 3) Messages from ship stations containing information on the presence of dangerous ice, dangerous wrecks, or any other imminent danger to marine navigation, shall be transmitted as soon as possible to other ships in the vicinity, and to the appropriate authorities through a coast station, or through a rescue coordination centre via a coast station or an appropriate coast earth station. These transmissions shall be preceded by the safety signal.

MOD

33.35 § 19 1) ~~In radiotelephony, the safety message shall be preceded by the safety signal (see No. **33.33**) repeated three times, and the identification of the transmitting station.~~The complete safety call consists of:

– the safety signal SÉCURITÉ, spoken three times;

– the name of the called station or “all stations”, spoken three times;

– the words THIS IS;

– the name of the station transmitting the safety message, spoken three times;

– the call sign or any other identification;

– the MMSI (if the initial announcement has been sent by DSC).~~;~~

Followed by the safety message or followed by the details of the channel to be used for the message in the case where a working channel is to be used.

In radiotelephony, on the selected working frequency, the safety call and message consists of:

– the safety signal SÉCURITÉ, spoken three times;

– the name of the called station or “all stations”, spoken three times;

– the words THIS IS;

– the name of the station transmitting the safety message, spoken three times;

– the call sign or any other identification;

– the MMSI (if the initial alert has been sent by DSC);

– the text of the safety message.

ADD

33.38A § 20*bis* 1) Ship stations in receipt of a safety announcement using digital selective calling techniques and the “All Ships” format setting, or otherwise addressed to all stations shall not acknowledge.

ADD

33.38B 2) Ship stations in receipt of an announcement of a safety message shall monitor the frequency or channel indicated for the message and shall listen until they are satisfied that the message is of no concern to them. They shall not make any transmission likely to interfere with the message.

MOD

Section V – Transmission of maritime safety informationMOD[1]

MOD

[1] **33.V.1** Maritime safety information includes navigation and meteorological warnings, meteorological forecasts and other urgent messages pertaining to safety ~~normally~~ transmitted ~~to or~~ from ~~ships, between ships and between ship and~~ coast stations or coast earth stations.

SUP

33.39A to **33.40**

MOD

Section VII – Use of other frequencies for ~~distress and~~ safety

MOD

33.53 § 28 Radiocommunications for ~~distress and~~ safety purposes concerning ship reporting communications, communications relating to the navigation, movements and needs of ships and weather observation messages may be conducted on any appropriate communications frequency, including those used for public correspondence. In terrestrial systems, the bands between 415 kHz and 535 kHz (see Article **52**), 1 606.5 kHz and 4 000 kHz (see Article **52**), 4 000 kHz and 27-500 kHz (see Appendix **17**) and 156 MHz and 174 MHz (see Appendix **18**) are used for this function. In the maritime mobile-satellite service, frequencies in the bands 1 530-1 544 MHz and 1 626.5-1 645.5 MHz are used for this function as well as for distress alerting purposes (see No. **32.2**).

SUP

33.54 and **33.55**

MOD

ARTICLE 34

MOD

34.1 § 1 The emergency position-indicating radiobeacon signal transmitted on 156.525 MHz and satellite EPIRB signals in the band 406-406.1 MHz ~~or 1 645.5-1 646.5 MHz~~ shall be in accordance with relevant ITU-R Recommendations, to include but not limited to Recommendation **604 (Rev.Mob-87)** ~~(see Resolution **27 (Rev.WRC-03)**)~~.

MOD

ARTICLE 41

MOD

41.1 Stations on board aircraft may communicate, for purposes of distress, and for public correspondence[1], with stations of the maritime mobile or maritime mobile-satellite services. For these purposes, they shall conform to the relevant provisions of Chapter **VII** and Chapter **IX**, Articles **51** (Section III), **53, 54, 55, 57** and **58** ~~and Appendix **13**~~ (see also Nos. **4.19, 4.20** and **43.4**).

MOD

ARTICLE 47

MOD

47.18 § 5 Each administration may determine the conditions under which personnel holding certificates ~~specified in Appendix **13**~~ may be granted certificates specified in Nos. **47.20** to **47.23**.

MOD

Section IV – Qualifying service~~[1]~~ (WRC-0~~3~~7)

SUP

~~[1] **47.IV.1**~~

MOD

ARTICLE 51

SUP

51.8 to **51.23**

MOD

51.53 *a)* send class J3E emissions on a carrier frequency of 2 182 kHz and receive class J3E emissions on a carrier frequency of 2 182 kHz, except for such apparatus as is referred to in No. **51.56** ~~(see also Appendix **13**)~~;

MOD

51.58 § 23 All ship stations equipped with radiotelephony to work in the authorized bands between 4 000 kHz and 27 500 kHz and which do not comply with the provisions of Chapter **VII** should be able to send and receive on the carrier frequencies 4 125 kHz and 6 215 kHz ~~(see Appendix **13**)~~. However, all ship stations which comply with the provisions of Chapter **VII** shall be able to send and receive on the carrier frequencies designated in Article **31** for distress and safety traffic by radiotelephony for the frequency bands in which they are operating.

MOD

51.79 2) The frequency 156.3 MHz may be used by stations on board aircraft for safety purposes. It may also be used for communication between ship stations and stations on board aircraft engaged in coordinated search and rescue operations (see ~~Appendices **13** and~~Appendix **15**).

MOD

51.80 3) The frequency 156.8 MHz may be used by stations on board aircraft for safety purposes only (see ~~Appendices **13** and~~Appendix **15**).

MOD

ARTICLE 52

SUP

~~**Section II — Use of frequencies for Morse radiotelegraphy**~~

~~**52.16** *A — General*~~

SUP

52.17 to **52.93**

MOD

52.101 2) Narrow-band direct-printing telegraphy is forbidden in the band 2 170-2 194 kHz except as provided for in Appendix **15~~3~~.**

MOD

52.183 § 86 1) Unless otherwise specified in the present Regulations (see Nos. **51.53**, **52.188**, **52.189**, and **52.199**~~ and Appendix **13**~~), the class of emission to be used in the bands between 1 606.5 kHz and 4 000 kHz shall be J3E. (WRC-0~~3~~7)

MOD

52.189 § 87 1) The frequency 2 182 kHz[2] is an international distress frequency for radiotelephony ~~(see Appendix **13** for details of its use for distress, urgency, safety and emergency position-indicating radiobeacon (EPIRB) purposes)~~.

MOD

52.209 2) The carrier frequencies 2 045 kHz and 2 048 kHz~~This frequency~~ shall not be used for working between stations of the same nationality[*].

MOD

---

[4] **52.221.2** The carrier frequencies 4 125 kHz and 6 215 kHz are also authorized for common use by coast and ship stations for single-sideband radiotelephony on a simplex basis for call and reply purposes, provided that the peak envelope power of such stations does not exceed 1 kW. The use of these frequencies for working purposes is not permitted (see also ~~Appendix **13** and~~ No. **52.221.1**).

MOD

52.231 § 101 1) The frequency 156.8 MHz is the international frequency for distress traffic and for calling by radiotelephony when using frequencies in the authorized bands between 156 MHz and 174 MHz ~~(see Appendix **13** for details of use)~~. The class of emission to be used for radiotelephony on the frequency 156.8 MHz shall be G3E (as specified in Recommendation ITU-R M.489-2). (WRC-0~~3~~7)

ADD

52.241A 10) The frequency 156.525 MHz is the international distress, safety and calling frequency for the maritime mobile VHF radiotelephone service using digital selective calling (DSC) when using frequencies in the authorized bands between 156 MHz and 174 MHz.

ADD

52.241B 11) All emissions in the band 156.4875-156.5625 MHz capable of causing harmful interference to the authorized transmissions of stations of the maritime mobile service on 156.525 MHz are forbidden.

ADD

52. 241C 12) To facilitate the reception of distress calls and distress traffic, all transmissions on 156.525 MHz shall be kept to a minimum.

MOD

52.242 § 102 1) ~~In addition to the watch referred to in Appendix **13**, a~~A coast station open to the international public correspondence service should, during its hours of service, maintain watch on its receiving frequency or frequencies indicated in the List of Coast Stations.

MOD

ARTICLE 57

MOD

57.1 § 1 The procedure detailed in Recommendation ITU-R M.1171 shall be applicable to radiotelephone stations, except in cases of distress, urgency or safety~~, to which the provisions of Appendix **13** are applicable~~. (WRC-0~~3~~7)

MOD

57.8 § 4 Calling, and signals preparatory to traffic, shall not exceed one minute when made on the carrier frequency 2 182 kHz or on 156.8 MHz, except in cases of distress, urgency or safety~~ to which the provisions of Appendix **13** apply~~.

MOD

APPENDIX 15 (Rev.WRC-07~~03~~)

Frequencies for distress and safety communications for the Global Maritime Distress and Safety System (GMDSS)

(See Article **31**)

The frequencies for distress and safety communications for the GMDSS are given in Tables 15-1 and 15-2 for frequencies below and above 30 MHz, respectively.

TABLE 15-1

Frequencies below 30 MHz

Frequency (kHz)	Description of usage	Notes
490	MSI	The frequency 490 kHz is used exclusively for maritime safety information (MSI). (WRC-03)
518	MSI	The frequency 518 kHz is used exclusively by the international NAVTEX system.
*2 174.5	NBDP-COM	
*2 182	RTP-COM	The frequency 2 182 kHz uses class of emission J3E. See also No. **52.190**~~and Appendix 13~~**.**
*2 187.5	DSC	
3 023	AERO-SAR	The aeronautical carrier (reference) frequencies 3 023 kHz and 5 680 kHz may be used for intercommunication between mobile stations engaged in coordinated search and rescue operations, and for communication between these stations and participating land stations, in accordance with the provisions of Appendix **27** (see Nos. **5.111** and **5.115**).
*4 125	RTP-COM	See also No. **52.221**~~ and Appendix 13~~. The carrier frequency 4 125 kHz may be used by aircraft stations to communicate with stations of the maritime mobile service for distress and safety purposes, including search and rescue (see No. **30.11**).
*4 177.5	NBDP-COM	
*4 207.5	DSC	
4 209.5	MSI	The frequency 4 209.5 kHz is exclusively used for NAVTEX-type transmissions (see Resolution **339 (Rev.WRC-~~97~~03)~~**~~**).
4 210	MSI-HF	
5 680	AERO-SAR	See note under 3 023 kHz above.
*6 215	RTP-COM	See also No. **52.221**~~ and Appendix 13~~.

TABLE 15-1 (*end*)

Frequency (kHz)	**Description of usage**	**Notes**
*6 268	NBDP-COM	
*6 312	DSC	
6 314	MSI-HF	
*8 291	RTP-COM	
*8 376.5	NBDP-COM	
*8 414.5	DSC	
8 416.5	MSI-HF	
*12 290	RTP-COM	
*12 520	NBDP-COM	
*12 577	DSC	
12 579	MSI-HF	
*16 420	RTP-COM	
*16 695	NBDP-COM	
*16 804.5	DSC	
16 806.5	MSI-HF	
19 680.5	MSI-HF	
22 376	MSI-HF	
26 100.5	MSI-HF	

Legend:

AERO-SAR These aeronautical carrier (reference) frequencies may be used for distress and safety purposes by mobile stations engaged in coordinated search and rescue operations.

DSC These frequencies are used exclusively for distress and safety calls using digital selective calling in accordance with No. **32.5** (see Nos. **32.9**, **33.11** and **33.34**).

MSI In the maritime mobile service, these frequencies are used exclusively for the transmission of maritime safety information (MSI) (including meteorological and navigational warnings and urgent information) by coast stations to ships, by means of narrow-band direct-printing telegraphy.

MSI-HF In the maritime mobile service, these frequencies are used exclusively for the transmission of high seas MSI by coast stations to ships, by means of narrow-band direct-printing telegraphy.

NBDP-COM These frequencies are used exclusively for distress and safety communications (traffic) using narrow-band direct-printing telegraphy.

RTP-COM These carrier frequencies are used for distress and safety communications (traffic) by radio-telephony.

* Except as provided in these Regulations, any emission capable of causing harmful interference to distress, alarm, urgency or safety communications on the frequencies denoted by an asterisk (*) is prohibited. Any emission causing harmful interference to distress and safety communications on any of the discrete frequencies identified in ~~Appendices 13 and 15~~this Appendix is prohibited.

~~** *Note by the Secretariat:* This Resolution was revised by WRC-03.~~

TABLE 15-2

Frequencies above 30 (MHz) (VHF/UHF)

Frequency (MHz)	Description of usage	Notes
*121.5	AERO-SAR	The aeronautical emergency frequency 121.5 MHz is used for the purposes of distress and urgency for radiotelephony by stations of the aeronautical mobile service using frequencies in the band between 117.975 MHz and 137 MHz. This frequency may also be used for these purposes by survival craft stations. Emergency position-indicating radio beacons use the frequency 121.5 MHz as indicated in Recommendation ITU-R M.690-1. Mobile stations of the maritime mobile service may communicate with stations of the aeronautical mobile service on the aeronautical emergency frequency 121.5 MHz for the purposes of distress and urgency only, and on the aeronautical auxiliary frequency 123.1 MHz for coordinated search and rescue operations, using class A3E emissions for both frequencies (see also Nos. **5.111** and **5.200**). They shall then comply with any special arrangement between governments concerned by which the aeronautical mobile service is regulated.
123.1	AERO-SAR	The aeronautical auxiliary frequency 123.1 MHz, which is auxiliary to the aeronautical emergency frequency 121.5 MHz, is for use by stations of the aeronautical mobile service and by other mobile and land stations engaged in coordinated search and rescue operations (see also No. **5.200**). Mobile stations of the maritime mobile service may communicate with stations of the aeronautical mobile service on the aeronautical emergency frequency 121.5 MHz for the purposes of distress and urgency only, and on the aeronautical auxiliary frequency 123.1 MHz for coordinated search and rescue operations, using class A3E emissions for both frequencies (see also Nos. **5.111** and **5.200**). They shall then comply with any special arrangement between governments concerned by which the aeronautical mobile service is regulated.
156.3	VHF-CH06	The frequency 156.3 MHz may be used for communication between ship stations and aircraft stations engaged in coordinated search and rescue operations. It may also be used by aircraft stations to communicate with ship stations for other safety purposes (see also Note *f*) in Appendix **18**).
*156.525	VHF-CH70	The frequency 156.525 MHz is used in the maritime mobile service for distress and safety calls using digital selective calling (see also Nos. **4.9**, **5.227**, **30.2** and **30.3**).
156.650	VHF-CH13	The frequency 156.650 MHz is used for ship-to-ship communications relating to the safety of navigation in accordance with Note *k*) in Appendix **18**.
*156.8	VHF-CH16	The frequency 156.8 MHz is used for distress and safety communications by radiotelephony ~~(see also Appendix 13).~~ Additionally, the frequency 156.8 MHz may be used by aircraft stations for safety purposes only.

TABLE 15-2 (*end*)

Frequency (MHz)	Description of usage	Notes
*406-406.1	406-EPIRB	This frequency band is used exclusively by satellite emergency position-indicating radio beacons in the Earth-to-space direction (see No. **5.266**).
1 530-1 544	SAT-COM	In addition to its availability for routine non-safety purposes, the band 1 530-1 544 MHz is used for distress and safety purposes in the space-to-Earth direction in the maritime mobile-satellite service. GMDSS distress, urgency and safety communications have priority in this band (see No. **5.353A**).
*1 544-1 545	D&S-OPS	Use of the band 1 544-1 545 MHz (space-to-Earth) is limited to distress and safety operations (see No. **5.356**), including feeder links of satellites needed to relay the emissions of satellite emergency position-indicating radio beacons to earth stations and narrow-band (space-to-Earth) links from space stations to mobile stations.
1 626.5-1 645.5	SAT-COM	In addition to its availability for routine non-safety purposes, the band 1 626.5-1 645.5 MHz is used for distress and safety purposes in the Earth-to-space direction in the maritime mobile-satellite service. GMDSS distress, urgency and safety communications have priority in this band (see No. **5.353A**).
*1 645.5-1 646.5	D&S-OPS	Use of the band 1 645.5-1 646.5 MHz (Earth-to-space) is limited to distress and safety operations (see No. **5.375**), including transmissions from satellite EPIRBs and relay of distress alerts received by satellites in low polar Earth orbits to geostationary satellites.
9 200-9 500	SARTS	This frequency band is used by radar transponders to facilitate search and rescue.

Legend:

AERO-SAR These aeronautical carrier (reference) frequencies may be used for distress and safety purposes by mobile stations engaged in coordinated search and rescue operations.

D&S-OPS The use of these bands is limited to distress and safety operations of satellite emergency position-indicating radio beacons (EPIRBs).

SAT-COM These frequency bands are available for distress and safety purposes in the maritime mobile-satellite service (see Notes).

VHF-CH# These VHF frequencies are used for distress and safety purposes. The channel number (CH#) refers to the VHF channel as listed in Appendix **18**, which should also be consulted.

* Except as provided in these Regulations, any emission capable of causing harmful interference to distress, alarm, urgency or safety communications on the frequencies denoted by an asterisk (*) is prohibited. Any emission causing harmful interference to distress and safety communications on any of the discrete frequencies identified in ~~Appendices 13 and **15**~~this Appendix is prohibited.

MOD

APPENDIX 16 (Rev.WRC-07)

(See Articles **42** and **51**)

Section I – Ship stations for which a ~~Morse radiotelegraph~~Global Maritime Distress and Safety System (GMDSS) installation is required by international agreement

These stations shall be provided with:

1 the licence prescribed by Article **18**;

2 certificates of the operator or operators;

3 a log in which the following are recorded as they occur, together with the time of the occurrence, unless administrations have adopted other arrangements for recording all information which the log should contain:

a) ~~all~~a summary of communications relating to distress, urgency and safety traffic ~~in full~~;

~~*b)* urgency and safety communications;~~

~~*c)* observance of watch on the international distress frequency during silence periods;~~

~~*d)* communications exchanged between the ship station and land or mobile stations;~~

~~e~~b) a reference to important service incidents ~~of all kinds~~;

~~f~~c) if the ship's rules permit, the position of the ship at least once a day;

~~*g)* the opening and closing of each period of service;~~

4 ~~the Alphabetical List of Call Signs of Stations used in the Maritime Mobile Service~~ITU Service Publications, in either printed or electronic format, containing a List of MMSI stations and other operational information in the Maritime Mobile Service (see Article **20**);

5 ~~the List of Coast Stations~~ITU Service Publications, in either printed or electronic format, showing the details of Coast Stations and Coast Earth Stations with which communications are likely to be conducted and a List of Coast Stations and Coast Earth Stations providing navigational and meteorological warnings and other urgent information for ships (see Article **20**);

6 ~~the List of Ship Stations (the carriage of the supplement is optional);~~the relevant rules and procedures of radiocommunications, e.g. Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services (paper or electronic format) (see Article **20**).

~~7 the List of Radiodetermination and Special Service Stations;~~

~~8 the Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services;~~

~~9 telegraph tariffs of the countries for which the station most frequently accepts radiotelegrams.~~

~~Section II – Other ship stations with Morse radiotelegraph facilities~~

~~These stations shall be provided with the documents mentioned in items 1 to 6, 8 and 9 of Section I.~~

<u>NOTE – Administrations may, under appropriate circumstances exempt ships from the carriage of the documents mentioned in items 4 to 6 above, or where equivalent publications with the same and similarly updated content exist, notify the changed carrier requirement to the Bureau which will make this publicly available.</u>

Section II~~I~~ – <u>Other s</u>~~S~~hip stations for which a radio~~telephone~~ installation is required ~~by international agreement~~

These stations shall be provided with:

1 the licence prescribed by Article **18**;

2 certificates of the operator or operators;

~~3 a log in which the following are recorded as they occur, together with the time of the occurrence, unless administrations have adopted other arrangements for recording all information which the log should contain:~~

~~*a)* a summary of all communications relating to distress, urgency and safety traffic;~~

~~*b)* a reference to important service incidents;~~

~~*c)* if the ship's rules permit, the position of the ship at least once a day;~~

<u>3 a log or other arrangements which the administration may have adopted for that purpose, in which a summary of communications related to distress, urgency and safety traffic shall be recorded together with the time of their occurrence;</u>

4 ~~a list of coast stations with which communications are likely to be conducted, showing watchkeeping hours, frequencies and charges~~<u>ITU Service Publications, in either printed or electronic format, showing the details of Coast Stations with which communications are likely to be conducted and a List of Coast Stations and Coast Earth Stations providing navigational and meteorological warnings and other urgent information for ships (see Article **20**)</u>;

5 ~~the provisions of the Radio Regulations and of the ITU-T Resolutions and Recommendations applicable to the maritime mobile radiotelephone service, or the Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services~~<u> the relevant rules and procedures of radiocommunications, e.g. Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services (paper or electronic format) (see Article **20**)</u>.

NOTE – Administrations may, under appropriate circumstances exempt ships from the carriage of the documents mentioned in items 4 and 5 above, or where equivalent publications with the same and similarly updated content exist, notify the changed carrier requirement to the Bureau which will make this publicly available.

Section I~~V~~II – Other ship ~~radiotelephone~~ stations

These stations shall be provided with:

1 the documents mentioned in items 1 and 2 of Section II~~I~~;

2 the documents mentioned in items ~~3,~~ 4 and 5 of Section II~~I~~, in accordance with the requirements of the administrations concerned.

NOTE – Administrations may, under appropriate circumstances exempt ships from the carriage of the documents mentioned in item 2, or where equivalent publications with the same and similarly updated content exist, notify the changed carrier requirement to the Bureau which will make this publicly available.

~~Section V – Ship stations equipped with multiple installations~~

~~These stations shall be provided with:~~

~~1 for each installation, if necessary, the documents mentioned in items 1 to 3 of Section I, or in items 1, 2 and 3 of Section III;~~

~~2 for only one installation, the other documents mentioned in Sections I or III, as appropriate.~~

~~Section VA – Stations on board ships for which a GMDSS installation is required by international agreement~~

~~These stations shall be provided with:~~

~~1 the licence prescribed by Article **18**;~~

~~2 the certificates prescribed in Article **48**;~~

~~3 a log in which the following are recorded as they occur, together with the time of their occurrence, unless administrations have adopted other arrangements for recording all information which the log should contain:~~

~~*a)* a summary of communications relating to distress, urgency and safety traffic;~~

~~*b)* a reference to important service incidents;~~

~~*c)* if the ship's rules permit, the position of the ship at least once a day;~~

~~4 the Alphabetical List of Call Signs and/or Numerical Table of Identities of Stations Used by the Maritime Mobile Service and Maritime Mobile-Satellite Service (Coast, Coast Earth, Ship, Ship Earth, Radiodetermination and Special Service Stations), Ship and Ship Earth Stations, Maritime Mobile Service Identities and Selective Call Numbers or Signals, and Coast and Coast Earth Stations, Maritime Mobile Service Identities and Identification Numbers or Signals (List VIIA);~~

~~5 a list of coast stations and coast earth stations with which communications are likely to be established, showing watch-keeping hours, frequencies and charges; and a list of coast stations and coast earth stations providing navigational and meteorological warnings and other urgent information for ships (see Article **20**);~~

~~6 the List of Ship Stations (the carriage of the supplement is optional);~~

~~7 the Manual for Use by the Maritime Mobile and Maritime Mobile-Satellite Services.~~

~~NOTE – Administrations may, under appropriate circumstances (for example, when ships are sailing only within range of VHF coast stations) exempt ships from the carriage of the documents mentioned in items 4 to 7 above.~~

Section IV~~I~~ – Stations on board aircraft

These stations shall be provided with:

1 the documents mentioned in items 1 and 2 of Section I;

2 a log, unless administrations have adopted other arrangements for recording all information which the log should contain;

3 ~~the documents~~those published documents, in either printed or electronic formats, containing official information relating to stations which the aircraft station may use for the execution of its service.

MOD

APPENDIX 17 (Rev.WRC-~~03~~07)

Frequencies and channelling arrangements in the high-frequency bands for the maritime mobile service

(See Article **52**)

All references to Appendix **13** should be removed.

MOD

RESOLUTION 331 (Rev.WRC-0~~3~~7)

Transition to the Global Maritime Distress and Safety System (GMDSS)

The World Radiocommunication Conference (Geneva, 200~~3~~7),

noting

that all ships subject to the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, are required to be fitted for the Global Maritime Distress and Safety System (GMDSS),

noting further

a) that a number of administrations have taken steps to implement the GMDSS also for classes of vessels not subject to SOLAS, 1974, as amended;

b) that an increasing number of vessels not subject to SOLAS, 1974, as amended, are making use of the techniques and frequencies of the GMDSS prescribed in Chapter **VII**;

c) that this Conference has amended Chapter **VII** to provide for maintaining interoperability between ships fitted for the GMDSS and ships not yet fully equipped for GMDSS ~~some administrations and vessels, not subject to SOLAS, 1974, as amended, may wish to continue to use provisions of Appendix **13** for distress and safety communications for a few years after this Conference~~;

~~*d)* that it would be costly for administrations to maintain in parallel for an excessive period of time shore-based facilities necessary to support both the old and new distress and safety systems;~~

~~*e)*~~*d)* that there may be a need to maintain existing shore-based distress and safety services ~~described in Appendix 13~~ for reception of distress, urgency and safety calling by voice on VHF channel 16 for some years after this Conference so that vessels not subject to SOLAS, 1974, as amended and not yet using the techniques and frequencies of the GMDSS will be able to attract attention and obtain assistance from these services until such time as they are able to participate in the GMDSS;

~~f) that the International Maritime Organization (IMO) has decided that on board SOLAS ships:~~

~~– listening watch on 2 182 kHz is no longer mandatory after 1 February 1999;~~

~~– listening watch on VHF channel 16 shall continue with a view to maintaining communication between SOLAS ships and vessels not fitted for the GMDSS;~~

~~– the required watch on VHF channel 16 will be reviewed prior to 2005;~~

e) that the International Maritime Organization (IMO) is of the view that listening watch on VHF channel 16 by SOLAS ships, while at sea, should be required and kept for a foreseeable future with a view to providing:

– a distress alerting and communication channel for non-SOLAS ships; and

– bridge-to-bridge communications;

~~*g)*~~*f)* that IMO has urged administrations to require all seagoing vessels under national legislation, and encourage all vessels voluntarily carrying VHF radio equipment to be fitted with facilities for transmitting and receiving distress alerts by digital selective calling (DSC) on VHF channel 70 ~~no later than 1 February 2005~~;

~~*h)* that listening watch by coast stations on 2 182 kHz is no longer mandatory;~~

~~*i)*~~*g)* that the Radio Regulations require GMDSS ships to keep watch on the appropriate DSC distress frequencies;

~~*j)*~~*h)* that separate provisions in the existing Radio Regulations designate VHF channel 16 ~~and the frequency 2 182 kHz~~ as the international channel for general calling by radiotelephony;

~~*k)* that the Radio Regulations establish that ship stations should, when practicable, keep watch on VHF channel 13;~~

~~*l)*~~*i)* that several administrations have established Vessel Traffic Service (VTS) systems and require their vessels to keep watch on local VTS channels;

~~*m)*~~*j)* that ships that are required by SOLAS to carry a radio station have been equipped with DSC, and many vessels subject to national carriage requirements are also being equipped with DSC, but the majority of many vessels that carry a radio station on a voluntary basis might not yet have DSC equipment;

~~*n)*~~*k)* that similarly, many administrations have established distress and safety service based on DSC watchkeeping, but the majority of port stations, pilot stations and other operational coast stations might not yet have been equipped with DSC facilities;

l) that provisions **52.190** to **52.192** and **52.232** to **52.234** allow 2 182 kHz and channel 16 to be used for call and reply,

~~*o)* that for the reasons in *noting further m)* and *n)* listed above, it will be necessary for some stations in the maritime mobile service to continue for some years to call each other by radiotelephony in certain situations,~~

~~*considering*~~

~~*a)* that the operation of the GMDSS described in Chapter **VII** and the distress and safety system described in Appendix **13** differ in many crucial aspects, such as means and methods of alerting, communication facilities available, announcement and transmission of maritime safety information, etc.;~~

~~*b)* that operation of the two systems in parallel for a long period would cause ever-increasing difficulties and incompatibilities between vessels operating in the two different systems and may thus seriously degrade safety at sea in general;~~

~~*c)* that the GMDSS overcomes the deficiencies of the aural watch-keeping on maritime distress and calling frequencies on which the distress and safety system described in Appendix **13** relies, by replacing these watches by automatic watch, i.e. digital selective calling and satellite communication systems;~~

~~*d)* that the listening watch on 2 182 kHz on board SOLAS ships and at some coast stations has ceased in accordance with the decisions of IMO mentioned in *noting further f)* above,~~

recognizing

a) that as indicated in *noting further a), b), f), j)* and *k)* above stations in the maritime mobile service are increasingly making use of the frequencies and techniques of the GMDSS;

b) that this Conference has adopted provisions for distress, urgency and safety calling by radiotelephony on VHF channel 16 and requiring ships, where practicable, to maintain watch on VHF channel 16;

c) the need to maintain existing shore-based distress and safety services for reception of distress, urgency and safety calling by voice on VHF channel 16 for some years after this Conference so that vessels not subject to SOLAS, 1974, as amended and not yet using the techniques and frequencies of the GMDSS will be able to attract attention and obtain assistance from these services until such time as they are able to participate in the GMDSS;

d) the need indicated in *noting further d)* above for maintaining existing shore-based distress, urgency and safety services on VHF channel 16, *resolves*

1 to retain~~, as an interim measure,~~ the provisions permitting use of VHF channel 16 and the frequency 2 182 kHz for general voice-calling;

2 to urge all administrations to assist in enhancing safety at sea by:

– encouraging all vessels to make use of finalize the transition to the GMDSS as soon as possible;

– encouraging, where appropriate, establishment of suitable shore-based facilities for GMDSS, either on an individual basis or in cooperation with other relevant parties in the area;

– encouraging all vessels carrying maritime VHF equipment to be fitted with DSC on VHF channel 70 as soon as possible, taking into account the relevant decisions of IMO;

– encouraging vessels to limit their use of VHF channel 16 and the frequency 2 182 kHz for calling to the minimum necessary, noting the provisions of No. **52.239**;

3 that coast stations forming part of shore-based arrangements in the area concerned for reception of distress calling by radiotelephony on VHF channel 16 should maintain an efficient watch on VHF channel 16. Such watch should be indicated in the List of Coast Stations.~~that administrations may release their ship stations and coast stations from the obligations described in Appendix **13** concerning listening watch on VHF channel 16 or 2 182 kHz or both, taking account of all aspects involved, such as:~~

~~– decisions by IMO and ITU on aural watch on 2 182 kHz and VHF channel 16;~~

~~– the GMDSS radio systems available in the area concerned;~~

~~– the compatibility problems mentioned in *considering a)* and *b)* above;~~

~~– the density and classes of vessels normally in the area;~~

~~– the geographical nature of the area and general navigational conditions within the area;~~

~~– other adequate measures taken to ensure safety communications for vessels sailing in the area,~~

~~when the development on transition to the GMDSS and the prevailing conditions in the area makes it reasonable to do so;~~

~~when doing so, administrations should:~~

~~– inform IMO of their decisions and submit to IMO details on the area concerned;~~

~~– inform the Secretary-General on the necessary details for inclusion in the List of Coast Stations,~~

4 that administrations may release their ship stations and coast stations from the listening watch on VHF channel 16 in respect of distress, urgency and safety calling by voice, in accordance with relevant decisions of IMO and ITU on aural watchkeeping requirements on channel 16, taking into account of the GMDSS radio systems available in the area concerned;

when doing so, administrations should:

– inform IMO of their decisions and submit to IMO details on the area concerned;

– inform the Secretary-General on the necessary details for inclusion in the List of Coast Stations,

instructs the ITU-R

to monitor the development and changes to the GMDSS, in particular

– watchkeeping requirements;

– distress alerting;

– carriage requirements,

and report to a future world radiocommunication conference on when further rationalization of Chapter **VII** should be considered,

resolves further

that the Secretary-General should ensure that such arrangements and details regarding the area concerned be indicated in relevant maritime publications,

instructs the Secretary-General

to bring this Resolution to the attention of IMO, the International Civil Aviation Organization (ICAO) and the International Organization of Marine Aids to Navigation and Lighthouse Authorities.

MOD

RESOLUTION 18 (~~Mob-83~~Rev.WRC-07)

Relating to the procedure for identifying and announcing the position of ships and aircraft of States not parties to an armed conflict[1]

~~The World Administrative Radio Conference for the Mobile Services (Geneva, 1983)~~The World Radiocommunication Conference (Geneva, 2007),

considering

a) that ships and aircraft encounter considerable risk in the vicinity of an area of armed conflict;

b) that for the safety of life and property it is desirable for ships and aircraft of States not parties to an armed conflict to be able to identify themselves and announce their position in such circumstances;

c) that radiocommunication offers such ships and aircraft a rapid means of self-identification and providing location information prior to their entering areas of armed conflict and during their passage through the areas;

d) that it is considered desirable to provide a supplementary signal and procedure for use, in accordance with customary practice, in the area of armed conflict by ships and aircraft of States representing themselves as not parties to an armed conflict;

resolves

1 that the frequencies for urgency signal and messages specified in ~~Appendix **13** of~~ the RR may be used by ships and aircraft of States not parties to an armed conflict for self-identification and establishing communications. The transmission will consist of the urgency or safety signals, as appropriate, described in ~~Appendix **13**~~Article **33** followed by the addition of the single group "NNN" in radiotelegraphy and by the addition of the single word "NEUTRAL" pronounced as in French "neutral" in radiotelephony. As soon as practicable, communications shall be transferred to an appropriate working frequency;

2 that the use of the signal as described in the preceding paragraph indicates that the message which follows concerns a ship or aircraft of a State not party to an armed conflict. The message shall convey at least the following data:

a) call sign or other recognized means of identification of such ship or aircraft;

b) position of such ship or aircraft;

[1] WRC-97 made editorial amendments to this Resolution.

c) number and type of such ships or aircraft;

d) intended route;

e) estimated time en route and of departure and arrival, as appropriate;

f) any other information, such as flight altitude, radio frequencies guarded, languages and secondary surveillance radar modes and codes;

3 that the provisions of ~~Appendix **13**~~Article **33** relating to urgency and safety transmissions, and medical transports shall apply as appropriate to the use of the urgency and safety signals, respectively, by such ship or aircraft;

4 that the identification and location of ships of a State not party to an armed conflict may be effected by means of appropriate standard maritime radar transponders. The identification and location of aircraft of a State not party to an armed conflict may be effected by the use of the secondary surveillance radar (SSR) system in accordance with procedures to be recommended by the International Civil Aviation Organization (ICAO);

5 that the use of the signals described above would not confer or imply recognition of any rights or duties of a State not party to an armed conflict or a party to the conflict, except as may be recognized by common agreement between the parties to the conflict and a non-party;

6 to encourage parties to a conflict to enter into such agreements,

requests the Secretary-General

to communicate the contents of this Resolution to the International Maritime Organization (IMO) and ICAO for such action as they may consider appropriate,

requests ITU-R

to recommend an appropriate signal in the digital selective calling system for use in the maritime mobile service and other appropriate information as necessary.

ADD

RESOLUTION [2 182 kHz] (WRC-07)

Distress and safety radiotelephony procedures for 2 182 kHz

The World Radiocommunication Conference (Geneva, 2007),

noting

a) that all ships subject to the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, are required to be fitted for the Global Maritime Distress and Safety System (GMDSS);

b) that some vessels not subject to SOLAS, 1974, as amended, may not be making use of the techniques and frequencies of the GMDSS prescribed in Chapter **VII** and may wish to continue using radiotelephony procedures for distress and safety communications on 2182 kHz until such time as they are able to participate in the GMDSS;

c) that some administrations may have a need to maintain shore-based radiotelephony distress and safety services on 2182 kHz so that vessels not subject to SOLAS, 1974, as amended and not yet using the techniques and frequencies of the GMDSS will be able to obtain assistance from these services until such time as they are able to participate in the GMDSS,

considering

a) that there needs to be some recognized guidance, for the use of radiotelephony on 2 182 kHz for distress and safety communications;

resolves

1 that ships, when in distress or when engaged in urgency or safety related communications on 2 182 kHz, use the radiotelephony procedures contained in the Annex to this Resolution;

2 that coast stations, in order to maintain communication with non-GMDSS ships in distress or engaged in urgency or safety related communications on 2 182 kHz, use the radiotelephony procedures contained in the Annex to this Resolution.

ANNEX TO RESOLUTION [2 182 kHz] (WRC-07)

Distress and safety radiotelephony procedures for 2 182 kHz

PART A1 – GENERAL

§ 1 The frequencies and techniques specified in this Resolution may be used in the maritime mobile service for stations[1] not required by national or international regulation to fit GMDSS equipment and for communications between those stations and aircraft. However, stations of the maritime mobile service, when additionally fitted with any of the equipment used by stations operating in conformity with the provisions specified in Chapter **VII**, should, when using that equipment, comply with the appropriate provisions of that Chapter.

[1] The term “Rescue Coordination Centre” as defined in the International Convention on Maritime Search and Rescue (1979) refers to a unit responsible for promoting the efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

§ 2 1) No provision of these Regulations prevents the use by a mobile station or mobile earth station in distress of any means at its disposal to attract attention, make known its position, and obtain help.

2) No provision of these Regulations prevents the use by stations on board aircraft or ships engaged in search and rescue operations, in exceptional circumstances, of any means at their disposal to assist a mobile station or mobile earth station in distress.

3) No provision of these Regulations prevents the use by a land station or coast earth station, in exceptional circumstances, of any means at its disposal to assist a mobile station or mobile earth station in distress (see also No. **4.16**).

§ 3 In cases of distress, urgency or safety, transmissions by radiotelephony should be made slowly and distinctly, each word being clearly pronounced to facilitate transcription.

§ 4 The abbreviations and signals of Recommendation ITU-R M.1172 and the Phonetic Alphabet and Figure Code in Appendix **14** should be used where applicable[2].

§ 5 Distress, urgency and safety transmissions may also be made using digital selective calling and satellite techniques and/or direct-printing telegraphy, in accordance with the provisions specified in Chapter **VII** and relevant ITU-R Recommendations.

§ 6 Mobile stations[3] of the maritime mobile service may communicate, for safety purposes, with stations of the aeronautical mobile service. Such communications shall normally be made on the frequencies authorized, and under the conditions specified, in Section I of Part A2 (see also § 2 1)).

§ 6A Mobile stations of the aeronautical mobile service may communicate, for distress and safety purposes, with stations of the maritime mobile service in conformity with the provisions of this Resolution.

§ 7 Any aircraft required by national or international regulations to communicate for distress, urgency or safety purposes with stations of the maritime mobile service shall be capable of transmitting and receiving class J3E emissions when using the carrier frequency 2 182 kHz or the carrier frequency 4 125.

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[2] The use of the Standard Marine Communication Phrases and, where language difficulties exist, the International Code of Signals, both published by the International Maritime Organization, is also recommended.

[3] Mobile stations communicating with the stations of the aeronautical mobile (R) service in bands allocated to the aeronautical mobile (R) service shall conform to the provisions of the Regulations which relate to that service and, as appropriate, any special arrangements between the governments concerned by which the aeronautical mobile (R) service is regulated.

PART A2 – FREQUENCIES FOR DISTRESS AND SAFETY

Section I – Availability of frequencies

A – 2 182 kHz

§ 1 1) The carrier frequency 2 182 kHz is an international distress frequency for radiotelephony; it may be used by ship, aircraft and survival craft stations when requesting assistance from the maritime services. It is used for distress calls and distress traffic, for the urgency signal and urgency messages and for the safety signal. Safety messages should be transmitted, when practicable, on a working frequency after a preliminary announcement on 2 182 kHz. The class of emission to be used for radiotelephony on the frequency 2 182 kHz shall be J3E. Distress traffic on 2 182 kHz following the reception of a distress call using digital selective calling should take into account that some shipping in the vicinity may not be able to receive this traffic.

2) If a distress message on the carrier frequency 2 182 kHz has not been acknowledged, the distress call and message may be transmitted again on a carrier frequency of 4 125 kHz or 6 215 kHz, as appropriate.

3) However, ship stations and aircraft which can transmit neither on the carrier frequency 2 182 kHz nor on the carrier frequencies 4 125 kHz or 6 215 kHz, may use any other available frequency on which attention might be attracted.

4) Coast stations using the carrier frequency 2 182 kHz for distress purposes and to send navigational warnings may transmit an audible alarm signal[4] of a short duration for the purpose of attracting attention to the message which follows.

B – 4 125 kHz

§ 2 1) The carrier frequency 4 125 kHz is used to supplement the carrier frequency 2 182 kHz for distress and safety purposes and for call and reply. This frequency is also used for distress and safety traffic by radiotelephony.

2) The carrier frequency 4 125 kHz may be used by aircraft to communicate with stations of the maritime mobile service for distress and safety purposes, including search and rescue.

C – 6 215 kHz

§ 3 The carrier frequency 6 215 kHz is used to supplement the carrier frequency 2 182 kHz for distress and safety purposes and for call and reply. This frequency is also used for distress and safety traffic by radiotelephony.

---

[4] Alarm signals may consist of transmissions of sinusoidal audio frequency tones 1 300 Hz, 2 200 Hz, or both. Different tone generation patterns may be used to signal the type of message which follows, and an alarm signal ending in a 10-second continuous tone could be used to identify a transmission by a coast station.

Section II – Protection of distress and safety frequencies

A – General

§ 4 1) Test transmissions on any of the distress and safety frequencies described above shall be kept to a minimum and, wherever practicable, be carried out on artificial antennas or with reduced power.

§ 5 Before transmitting on any of the frequencies identified for distress and safety communications, a station shall listen on the frequency concerned to make sure that no distress transmission is being sent (see Recommendation ITU-R M.1171). This does not apply to stations in distress.

B – 2 182 kHz

§ 6 1) Except for transmissions authorized on the carrier frequency 2 182 kHz and on the frequencies 2 174.5 kHz, 2 177 kHz, 2 187.5 kHz and 2 189.5 kHz, all transmissions on the frequencies between 2 173.5 kHz and 2 190.5 kHz are forbidden (see also Appendix **15**).

2) To facilitate the reception of distress calls, all transmissions on 2 182 kHz should be kept to a minimum.

Section III – Watch on distress frequencies

A – 2 182 kHz

§ 7 1) Coast stations may maintain a watch on the carrier frequency 2182 kHz if so directed by the Administration. Such watch should be indicated in the list of coast stations.

2) Ship stations not fitted with equipment compatible with the GMDSS are encouraged to keep the maximum watch practicable on the carrier frequency 2 182 kHz.

B – 4 125 kHz, 6 215 kHz

§ 8 1) Coast stations may maintain additional watch, as permitted, on the carrier frequencies 4 125 kHz and 6 215 kHz. Such watch, if maintained, should be indicated in the list of coast stations.

PART A3 – DISTRESS COMMUNICATIONS

Section I – General

§ 1 The distress call shall have absolute priority over all other transmissions. All stations which hear it shall immediately cease any transmission capable of interfering with the distress traffic, and shall continue to listen on the frequency used for the emission of the distress call. This call shall not be addressed to a particular station and acknowledgement of receipt shall not be given until the distress message which follows is sent.

§ 2 The RT procedures for distress communications are found in Article **32**.

PART A4 – URGENCY AND SAFETY COMMUNICATIONS

Section I – Urgency signal and messages

§ 1 The RT procedures for urgency and safety communications are found in Article **33**.

Section III – Safety signal and messages

§ 7 In radiotelephony, the safety signal consists of the word SÉCURITÉ pronounced clearly in French. The safety signal shall be repeated three (3) times before the call.

§ 8 1) The safety signal indicates that the station is about to transmit a message containing an important navigational or an important meteorological warning.

2) The safety signal and call shall be sent on one or more of the international distress frequencies (2 182 kHz) or on any other frequency which may be used in case of distress (see also No. **33.32**).

3) The safety message which follows the call should be sent on a working frequency. A suitable announcement to this effect shall be made at the end of the call.

4) In the maritime mobile service, safety messages shall generally be addressed to all stations. In some cases, they may be addressed to a particular station.

§ 9 § 4 All stations hearing the safety signal shall listen to the safety message until they are satisfied that the message is of no concern to them. They shall not make any transmission likely to interfere with the message.

5/1.14/5.2 Method for Issue B

MOD

APPENDIX 18 (Rev.WRC-~~2000~~07)

Table of transmitting frequencies in the VHF maritime mobile band

(See Article **52**)

MOD

NOTE A – For assistance in understanding the Table, see Notes *a)* to *~~o~~p)* below. (WRC-~~2000~~7)

ADD

NOTE B – The Table below defines the channel numbering for conventional maritime VHF based on 25 kHz channel spacing and use of several duplex channels but allows also the use of 12.5 kHz channel spacing. The channel numbering for 12.5 kHz channels and the conversion of two-frequency channels for single-frequency operation shall be in accordance with Recommendation ITU-R M.1084-4 Annex 4, Tables 1 and 3.

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From ~~s~~Ships ~~stations~~	~~Coast stations~~ From shore		Single frequency	Two frequency	
60	*m), o)*	156.025	160.625			x	x
01	*m), o)*	156.050	160.650			x	x
61	*m), o)*	156.075	160.675		x	x	x
02	*m), o)*	156.100	160.700		x	x	x
62	*m), o)*	156.125	160.725		x	x	x
03	*m), o)*	156.150	160.750		x	x	x
63	*m), o)*	156.175	160.775		x	x	x
04	*m), o)*	156.200	160.800		x	x	x
64	*m), o)*	156.225	160.825		x	x	x
05	*m), o)*	156.250	160.850		x	x	x
65	*m), o)*	156.275	160.875		x	x	x
06	*f)*	156.300		x			
66	*m), o)*	156.325	160.925			x	x
07	*m), o)*	156.350	160.950			x	x
67	*h)*	156.375	156.375	x	x		
08		156.400		x			
68		156.425	156.425		x		
09	*i)*	156.450	156.450	x	x		
69		156.475	156.475	x	x		
10	*h), q)*	156.500	156.500	x	x		

Channel designator	Notes	Transmitting frequencies (MHz)		Inter-ship	Port operations and ship movement		Public corres-pondence
		From s~~S~~hips ~~stations~~	~~Coast stations~~ From shore		Single frequency	Two frequency	
70	*f), j)*	156.525	156.525	Digital selective calling for distress, safety and calling			
11	*q)*	156.550	156.550		x		
71		156.575	156.575		x		
12		156.600	156.600		x		
72	*i)*	156.625		x			
13	*k)*	156.650	156.650	x	x		
73	*h), i)*	156.675	156.675	x	x		
14		156.700	156.700		x		
74		156.725	156.725		x		
15	*g)*	156.750	156.750	x	x		
75	*n)*	156.775	156.775		x		
16	*f)*	156.800	156.800	DISTRESS, SAFETY AND CALLING			
76	*n)*	156.825	156.825		x		
17	*g)*	156.850	156.850	x	x		
77		156.875		x			
18	*m)*	156.900	161.500		x	x	x
78	*m)*	156.925	161.525			x	x
19	*m)*	156.950	161.550			x	x
79	*m)*	156.975	161.575			x	x
20	*m)*	157.000	161.600			x	x
80	*m)*	157.025	161.625			x	x
21	*m)*	157.050	161.650			x	x
81	*m)*	157.075	161.675			x	x
22	*m)*	157.100	161.700		x	x	x
82	*m), o)*	157.125	161.725		x	x	x
23	*m), o)*	157.150	161.750		x	x	x
83	*m), o)*	157.175	161.775		x	x	x
24	*m), o)*	157.200	161.800		x	x	x
84	*m), o)*	157.225	161.825		x	x	x
25	*m), o)*	157.250	161.850		x	x	x
85	*m), o)*	157.275	161.875		x	x	x
26	*m), o)*	157.300	161.900		x	x	x
86	*m), o)*	157.325	161.925		x	x	x
27		157.350	161.950			x	x
87		157.375	157.375		x		
28		157.400	162.000			x	x
88		157.425	157.425		x		
AIS 1	*l), p), f)*	161.975	161.975				
AIS 2	*l), p), f)*	162.025	162.025				

Notes referring to the Table

General notes

MOD

e) Administrations ~~having an urgent need to reduce local congestion~~ may apply 12.5 kHz channel interleaving on a non-interference basis to 25 kHz channels, in accordance with the most recent version of Recommendation ITU-R M.1084, provided:

– ~~Recommendation ITU-R M.1084-2 shall be taken into account when changing to 12.5 kHz channels;~~

– it shall not affect the 25 kHz channels of the present Appendix maritime mobile distress and safety frequencies, especially the channels 06, 13, 15, 16, 17, and 70, nor the technical characteristics ~~mentioned~~set forth in Recommendation ITU-R M.489-2 for those channels;

– implementation of 12.5 kHz channel interleaving and consequential national requirements shall be subject to prior agreement between the implementing administrations and administrations whose ship stations or services may be affected.

Specific notes

MOD

f) The frequenc~~y~~ies 156.300 MHz (channel 06) ~~(see No. **51.79** and Appendices **13** and **15**)~~, 156.525 MHz (channel 70), 156.800 MHz (channel 16), 161.975 MHz (AIS 1) and 162.025 MHz (AIS 2) may also be used ~~for communication between ship stations and~~by aircraft ~~stations engaged in coordinated~~for the purpose of search and rescue operations and other safety related communication. ~~Ship stations shall avoid harmful interference to such communications on channel 06 as well as to communications between aircraft stations, ice-breakers and assisted ships during ice seasons.~~

MOD

l) These channels (AIS 1 and AIS 2) ~~will be~~are used for an automatic ~~ship~~ identification ~~and surveillance~~ system capable of providing worldwide operation ~~on high seas~~in accordance with ITU-R Recommendations, unless other frequencies are designated on a regional basis for this purpose.

MOD

m) These channels may be operated as single frequency channels, subject to ~~special arrangement~~prior agreement between interested ~~or~~and affected administrations. (WRC-~~2000~~7)

MOD

o) These channels may be used to provide bands for ~~initial testing and the possible future introduction of~~ new technologies, subject to ~~special arrangement~~prior agreement between interested ~~or~~and affected administrations. Stations using these channels or bands for ~~the testing and the possible future introduction of~~ new technologies shall not cause harmful interference to, and shall not claim protection from, other stations operating in accordance with Article **5**. (WRC-~~2000~~7)

ADD

p) Additionally, AIS 1 and AIS 2 may be used by the maritime mobile-satellite service (Earth-to-space) for the reception of AIS transmissions from ships.

ADD

q) When using these channels (10 and 11), all precautions should be taken to avoid harmful interference to channel 70.

Agenda item 1.15

"to consider a secondary allocation to the amateur service in the frequency band 135.7-137.8 kHz"

NOTE – There is no corresponding WRC Resolution for this agenda item.

Executive summary

Agenda item 1.15 is to consider a secondary allocation to the amateur service in the band 135.7-137.8 kHz. ITU-R studies have shown that the radiation efficiency is typically less than 1% from practical antennas at typical amateur stations, resulting in practice in an e.i.r.p. of about 1 W. Reception over long paths has been demonstrated using receiving systems employing long integration times.

Two methods to satisfy the agenda item have been identified. Method A is the addition of a new entry to the Table of Frequency Allocations. Method B is the "No Change" method.

Since 1997, radio amateurs in some countries in parts of all three Regions were granted authority to operate in the band. There have been no reports of interference to other radiocommunication services.

5/1.15/1 Background

In the period 1994-2004, more than 20 administrations have given domestic amateur allocations or have authorized experimental amateur communications in the low-frequency range including 73 kHz, 135.7-137.8 kHz, and 160-190 kHz.

In 1997, amateurs in Europe were given formal authority to operate in an LF band pursuant to the European Conference of Postal and Telecommunications Administrations (CEPT) Recommendation 62-01 E (Mainz, 1997), which pertains to the use of the band 135.7-137.8 kHz by the amateur service. Currently, amateurs are active in the band 135.7-137.8 kHz in more than 25 European countries. Operation in the Russian Federation has been authorized in both the European and Asiatic parts of the Federation.

In Region 3, New Zealand has granted an allocation to the amateur service in this band, and Australia has authorized some experimental communication.

In Region 2, a number of South American countries have authorized amateur use of the 135.7-137.8 kHz band, and Canadian and American amateurs have been conducting communications under experimental licences. With the approval of the CEPT Recommendation in Europe, France has also authorized the use of the band 135.7-137.8 kHz by St. Pierre and Miquelon, Martinique and Guadeloupe.

5/1.15/2 Summary of technical and operational studies, and relevant ITU-R Recommendations

The use of digital processing to recover very weak signals permits long distance communications at a low transmitted e.i.r.p. This fact, combined with a high atmospheric noise level, and the propagation characteristics of the 135.7-137.8 kHz band greatly reduces the potential of interference to other services.

An allocation of an LF band to the amateur service would be in accordance with *recommends* 1 and 3 of Recommendation ITU-R M.1044-2.

5/1.15/3 Analysis of the results of studies

No cases of interference to other services from amateur service operations in the frequency band 135.7-137.8 kHz have been reported.

The frequency band 135.7-137.8 kHz is allocated on primary basis to fixed and maritime mobile services in the three Regions and to the radiolocation service in Region 3.

RR No. **5.67** provides an additional allocation in Azerbaijan, Bulgaria, Mongolia, Kyrgyzstan, Romania and Turkmenistan, to the radionavigation service on a secondary basis.

With a secondary allocation, amateur stations are obliged not to interfere with stations of primary services operating in accordance with the Table of Frequency Allocations; additional provision is needed to offer appropriate protection to stations operating in accordance with RR No. **5.67**.

5/1.15/4 Methods to satisfy the agenda item

5/1.15/4.1 Method A

Addition of a new entry to the Table of Frequency Allocations to allow for the use of the band 135.7-137.8 kHz by the amateur service in all three Regions on a secondary basis, with the corresponding footnote(s) ensuring protection of other services operating in the same band. Two alternative footnotes are proposed. One with explicit power limit and the other one with the power limit left to the decision of the administrations concerned.

Reasons: A secondary allocation to the amateur service in the frequency band 135.7-137.8 kHz would harmonize on a worldwide basis the use of this band.

Advantages:

A secondary allocation to the amateur service in the frequency band 135.7-137.8 kHz would:

– be in harmony with similar allocations that have been approved or are being sought in North America, Europe, Australia, New Zealand and part of Asia;

– provide radio amateurs with the opportunity to participate in and contribute to a new aspect of radiocommunications which would be consistent with the basis and purpose of the amateur service and would further the self-training in the radio art that is a principal obligation of the amateur service;

– provide an opportunity for experimentation with equipment, techniques, antennas and propagation phenomena in an interesting frequency band heretofore unavailable to the amateur service;

– provide an opportunity for experimentation of potential benefit to other services in keeping with the amateur service's tradition of contributing to the development of radiocommunication techniques and practices; and

– recognize the value of experimentation in attracting young people to the amateur service.

Disadvantages:

– None foreseen.

5/1.15/4.2 Method B

No change to the current RR Article **5**.

5/1.15/5 Regulatory and procedural considerations

The effective date of the change to the Table of Frequency Allocations (Method A) needs to be decided by the Conference.

The following is an example of a possible modification to the RR Article **5** Table of Frequency Allocations, offering appropriate protection to radionavigation service for countries listed in RR No. **5.67**.

MOD

110-255 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
...		
130-~~148.5~~135.7 FIXED MARITIME MOBILE 5.64 5.67	**130-~~160~~135.7** FIXED MARITIME MOBILE 5.64	**130-~~160~~135.7** FIXED MARITIME MOBILE RADIONAVIGATION 5.64
135.7-137.8 FIXED MARITIME MOBILE Amateur ADD 5.AAA 5.64 5.67	**135.7-137.8** FIXED MARITIME MOBILE Amateur ADD 5.AAA 5.64	**135.7-137.8** FIXED MARITIME MOBILE RADIONAVIGATION Amateur ADD 5.AAA 5.64
137.8-148.5 FIXED MARITIME MOBILE 5.64 5.67	**137.8-160** FIXED MARITIME MOBILE 5.64	**137.8-160** FIXED MARITIME MOBILE RADIONAVIGATION 5.64
...	...	...

ADD

5.AAA Stations in the amateur service using frequencies in the band 135.7-137.8 kHz shall not exceed a maximum radiated power of 1 W (e.i.r.p.) and shall not cause harmful interference to stations of the radionavigation service operating in countries listed in No. **5.67**.

Alternative text for footnote **5.AAA**:

ADD

5.AAA Stations in the amateur service using frequencies in the band 135.7-137.8 kHz shall not cause harmful interference to stations of the radionavigation service operating in countries listed in No. **5.67**. The provisions of No. **25.7** shall apply.

Agenda item 1.16

"to consider the regulatory and operational provisions for Maritime Mobile Service Identities (MMSIs) for equipment other than shipborne mobile equipment, taking into account Resolutions 344 (Rev.WRC-03) and 353 (WRC-03)"

Executive summary

Issue A

There is a need to manage the allotment and distribution of the maritime identification digits (MID) resource within the Maritime Mobile Service Identities (MMSI) numbering format (Resolution **344 (Rev.WRC-03)**). No urgent need for improving the management of the MID and MMSI resources was identified.

Issue B

There is a need to review the MMSI operational and procedural requirements for equipment other than shipborne mobile equipment and to develop an appropriate format, which cannot be confused with the format used for ship and coast stations (Resolution **353 (WRC-03)**).

A number of applications for MMSI assignments for equipment other than shipborne mobile equipment have been identified in the studies for WRC-07 Agenda Item 1.16. To date, these include MMSI assignments for search and rescue (SAR) aircraft, aids to navigation, and crafts associated with a parent ship.

Two methods have been identified to satisfy this issue of the agenda item. The proposed methods involve:

a) Revisions to RR Article **19**, taking into account Recommendation ITU-R M.585, and

b) Revisions to RR Article **19**, incorporating Recommendation ITU-R M.585 by reference.

Both methods will lead to the same result. However, there are substantial differences in the application of both methods and in the benefits offered by each.

Resolution 344 (Rev.WRC-03) – Management of the maritime mobile service identity numbering resource

5/1.16/1 Issue A

invites ITU-R

"to keep under review the Recommendations for assigning MMSIs, with a view to:

– improving the management of the MID and MMSI resources; and

– identifying alternative resources if there is an indication of rapid exhaustion of these resources"

5/1.16/1.1 Background

Maritime mobile service identities (MMSI) are required for many shipborne communication equipment (e.g. digital selective calling (DSC) radios and automatic identification system (AIS) equipment). The MMSI is a 9-digit figure that provides a unique identification for ship stations, group ship stations, coast stations and group coast stations. Three of the nine MMSI digits are the maritime identification digits (MID). MIDs represent the territory or geographical area of administrations and are assigned by ITU.

5/1.16/1.2 Summary of technical and operational studies and relevant ITU-R Recommendations

No urgent need for improving the management of the MID and MMSI resources was identified.

5/1.16/1.3 Analysis of the results of studies

No urgent need for improving the management of the MID and MMSI resources was identified.

Resolution 353 (WRC-03) – Maritime mobile service identities for equipment other than shipborne mobile equipment

5/1.16/2 Issue B

“*resolves to invite ITU-R*

to review the MMSI operational and procedural requirements and to develop an appropriate format which cannot be confused with the format used for ship and coast stations”

5/1.16/2.1 Background

MMSI currently cannot be issued to aircraft. MMSI for aircraft were discussed at WRC-03. The main concern expressed by administrations was the belief that changing the Radio Regulations during WRC-03 was premature; some ITU-R studies would be required to ensure that there would be no incompatibility issues with the existing systems. There was additional concern that allowing DSC equipment on aircraft might degrade the effectiveness of the GMDSS.

5/1.16/2.2 Summary of technical and operational studies, and relevant ITU-R Recommendations

Relevant ITU Recommendations: ITU-R M.585-3 (under revision, see Doc. 8/156).

The expansion of MMSI for aircraft is proposed for effective maritime search and rescue (SAR) operations and enhancements of the maritime navigation systems. SAR aircraft require the assignment of MMSI to enable effective radio communications with ships during emergency situations. During WRC-03 several administrations expressed a need to assign MMSI to aids-to-navigation as outlined in Resolution **353 (WRC-03)**. Also, the assignment of MMSI to aids-to-navigation will increase maritime navigational safety. The groups of MMSI intended for assignment to equipment other than shipborne mobile equipment must be unique to prevent confusion with the MMSI used by ships and coast stations.

5/1.16/2.3 Analysis of the results of studies

RR Article **19** should be modified to allow for assignment of MMSI to aeronautical stations involved in maritime SAR. Some administrations are currently studying and in some cases implementing the replacement of existing radar transponder beacons (RACON) with AIS equipment that require the use of MMSI as an enhancement to maritime navigation and safety. The use of AIS equipment will permit detection and identification of aids-to-navigation at greater ranges, and the potential to integrate the digital data into the shipboard navigational system.

The issuance of MMSI for equipment other than shipborne mobile equipment should be done with a prefix blocking one or more MIDs from allocation to countries.

The identification system for aircraft needs to take into account that the MMSI clearly indicates whether the call comes from a ship or an aircraft.

5/1.16/3 Methods to satisfy the agenda item

5/1.16/3.1 Issue B, Method A:

Revise RR Article **19**, taking into account revisions to Recommendation ITU-R M.585.

Advantages:

Provisions for MMSI in RR Article **19** contain regulatory aspects as well as procedural considerations, rendering RR Article **19** self-contained.

RR Article **19** contains the formats to be used for the assignment of MMSI and gives certainty to the regulatory status of the provisions for the use of MMSI.

Disadvantages:

None identified at this time.

5/1.16/3.2 Issue B, Method B:

Revise RR Article **19**, incorporating Recommendation ITU-R M.585 by reference.

Advantages:

Future introduction of new MMSI requirements is facilitated without the need for a dedicated WRC agenda item; revisions to Recommendation ITU-R M.585 can be approved during a study period and the standing WRC Agenda item 2 provides the mechanism for each WRC to decide whether or not to update the corresponding reference in the RR.

Provisions for MMSI in RR Article **19** are minimized and remain more focused on regulatory aspects versus procedural considerations.

Duplication of provisions is eliminated; the MMSI numbering format would only be specified in the revisions to Recommendation ITU-R M.585 and would no longer be required in RR Article **19**.

Disadvantages:

None identified at this time.

5/1.16/4 Regulatory and procedural considerations

5/1.16/4.1 Method A

An example of modifications of RR Article **19** is provided:

MOD

19.30 2) As the need arises, ship stations and ship earth stations to which the provisions of Chapter **IX** apply, and coast stations, ~~or~~ coast earth stations~~,~~, aircraft, aids to navigation, or crafts associated with a parent ship capable of communicating with such ship stations, shall have assigned to them maritime mobile service identities in accordance with Section VI of this Article.

MOD

Section VI – Maritime mobile service identities ~~in the maritime mobile service and the maritime mobile-satellite service~~

MOD

19.99 § 39 When a station[5] in the maritime mobile service or the maritime mobile-satellite service is required to use maritime mobile service identities, the responsible administration shall assign the identity to the station in accordance with the provisions described in Nos. **19.100** to **19.126J**; in so doing, it should take into account the relevant ITU-R and ITU-T Recommendations. In accordance with No. **20.16**, administrations shall notify the Bureau immediately when assigning maritime mobile service identities.

MOD

19.100 § 40 1) Maritime mobile service identities are formed of a series of nine digits which are transmitted over the radio path in order to uniquely identify ship stations, ship earth stations, coast stations, coast earth stations ~~and~~ group calls, aircraft, aids to navigation, and crafts associated with a parent ship.

MOD

19.102 3) There are ~~four~~ six kinds of maritime mobile service identities:

MOD

19.107 v) identities for aircraft communicating with stations in the maritime mobile service for search and rescue purposes; ~~Not used.~~

ADD

19.107A vi) aids to navigation and crafts associated with a parent ship.

MOD

19.108A § 41 The maritime identification digits $M_1I_2D_3$ are an integral part of the maritime mobile service identity and denote the geographical area of the administration responsible for the station so identified (see Nos. **19.102** to **19.~~106~~107A**).~~ (WRC-03~~07~~)~~

ADD

19.126A *G – Identities for Aircraft*

ADD

19.126B § 46A 1) When an aircraft is required to use maritime mobile service identities for the purposes of conducting search and rescue communications with stations in the maritime mobile service, the responsible administration shall assign a 9-digit code formed as follows:

$$1_1 1_2 1_3 M_4 I_5 D_6 X_7 X_8 X_9$$

where the first three figures are ones and X is any figure from 0 to 9.

ADD

19.126C 2) The MID represents only the territory or geographical area of the administration assigning identity for aircraft.

ADD

19.126D 3) The combination $1_1 1_2 1_3 M_4 I_5 D_6 0_7 0_8 0_9$ may be used for a group aircraft identity to all search and rescue aircraft of an administration, where the last three figures are zeros.

ADD

19.126E *H – Aids to navigation and crafts associated with a parent ship*

ADD

19.126F § 46B 1) When a means of automatic identification is required for a station aiding navigation at sea, the responsible administration shall assign a 9-digit code formed as follows:

$$9_1 9_2 M_3 I_4 D_5 X_6 X_7 X_8 X_9$$

where the first two figures are nines and X is any figure from 0 to 9.

ADD

19.126G 2) The MID represents only the territory or geographical area of the administration assigning the call identity for the navigational aid.

ADD

19.126H 3) Devices located in lifeboats, life rafts and other craft, belonging to a parent ship, the administration concerned shall assign a 9-digit code formed as follows:

$$9_1 8_2 M_3 I_4 D_5 X_6 X_7 X_8 X_9$$

where the first two figures are nine and eight respectively and X is any figure from 0 to 9.

ADD

19.126I 4) These MMSI should be associated with the MMSI of a parent ship by means of database registration.

ADD

19.126J 5) The MID represents only the territory or geographical area of the administration assigning the call identity for the craft associated with a parent ship.

5/1.16/4.2 Method B

The detail of the MMSI allocation contained within ITU-R M.585 is removed from RR Article **19** and the most current version of that Recommendation existing at the time of WRC-07 is incorporated by reference in accordance with Resolution **27 (WRC-03)**. An example of modifications of RR Article **19** is provided. In this example, the term “Recommendation ITU-R M.585-4” intends to refer to that version of Recommendation ITU-R M.585 in force at the time the WRC.[2] The example follows:

MOD

19.30 2) As the need arises, ship stations and ship earth stations to which the provisions of Chapter **IX** apply, and coast stations or coast earth stations<u>, or other non-shipborne stations</u> capable of communicating with such ship stations, shall have assigned to them maritime mobile service identities in accordance with Section VI of this Article.

[2] Method B assumes that version 4 of the Recommendation has been adopted by the time of WRC-07.

MOD

Section VI – Maritime mobile service identities ~~in the maritime mobile service and the maritime mobile-satellite service~~

MOD

19.99 § 39 When a station[5] operating in the maritime mobile service or the maritime mobile-satellite service is required to use maritime mobile service identities, the responsible administration shall assign the identity to the station in accordance with the provisions described in ~~Nos. **19.100** to **19.126**;~~ Recommendation ITU-R M.585-4; in so doing, it should take into account ~~the~~ any other relevant ITU-R and ITU-T Recommendations. In accordance with No. **20.16,** administrations shall notify the Bureau immediately when assigning maritime mobile service identities.

MOD

19.100 § 40 1) Maritime mobile service identities are formed of a series of nine digits which are transmitted over the radio path in order to uniquely identify ship stations, ship earth stations, coast stations, coast earth stations ~~and~~ group calls, and other non-shipborne stations operating in the maritime mobile service or the maritime mobile satellite service.

MOD

19.102 3) th~~ere are four kinds~~ types of maritime mobile service identities shall be as described in Recommendation ITU-R M.585-4.

SUP

19.103 to **19.107**

MOD

19.108A § 41 The maritime identification digits $M_1I_2D_3$ are an integral part of the maritime mobile service identity and denote the geographical area of the administration responsible for the station so identified ~~(see Nos. **19.102** to **19.106**)~~. (WRC-~~03~~07)

MOD

19.110 *C – Maritime mobile service ~~Ship station~~ identities*

MOD

19.111 § 43 1) Administrations ~~should:~~shall follow the provisions contained in Recommendation ITU-R M.585-4 concerning the assignment and use of maritime mobile service identities.

MOD

19.112 2) Administrations should:~~*a)* follow the guidelines contained in the most recent version of Recommendation ITU-R M.585 concerning the assignment and use of ship station identities; (WRC-03)~~

MOD

19.113 *~~b~~a)* make optimum use of the possibilities of forming identities from the single MID allocated to them;

MOD

19.114 *~~c~~b)* take particular care in assigning ship station identities with six significant digits (i.e. having three-trailing-zero identities), which should be assigned only to ship stations which can reasonably be expected to require such an identity for automatic access on a worldwide basis to public switched networks, in particular for mobile-satellite systems accepted for use in the GMDSS on or before 1 February 2002, as long as those systems maintain the MMSI as part of their numbering scheme. (WRC-~~03~~07)

SUP

19.115 to **19.126**

CHAPTER 6

REGULATORY PROCEDURES AND ASSOCIATED TECHNICAL CRITERIA APPLICABLE TO SATELLITE NETWORKS

(Agenda items 1.10, 1.12 and 7.1*)

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* Consideration of the status of ITU-R studies under Agenda item 7.1 is contained in Chapter 7 of the CPM Report.

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* Consideration of the status of ITU-R studies under Agenda item 7.1 is contained in Chapter 7 of the CPM Report.

Agenda item 1.10

"to review the regulatory procedures and associated technical criteria of Appendix 30B without any action on the allotments, the existing systems or the assignments in the List of Appendix 30B"

Executive summary

The principle of RR Appendix **30B**, adopted by WARC-Orb-85 and included in WARC-Orb-88 was to provide *an equitable access for all ITU Member States to the orbit/spectrum resources* associated with the frequency bands regulated by this Appendix through the establishment of an Allotment Plan (Part A of the Plan) together with the "existing systems" (Part B of the Plan). Associated with this Allotment Plan was 800 MHz of spectrum for use within the territory of the country, consisting of 300 MHz in the 6/4 GHz band and 500 MHz in the 13/10-11 GHz band.

It was agreed that a revision of RR Appendix **30B** should be based upon the following principles:

a) The RR Appendix **30B** Plan should remain an allotment Plan with one orbital position for each country, except for those countries for which more than one orbital position was assigned by WARC-Orb-88, associated with 800 MHz in the 6/4 and 13/10-11 GHz bands.

b) Any administration participating in a multi-national network or having agreed to networks of another administration with a service area covering parts or all of its territory retain the right to comment in respect of their own allotments or assignments.

c) Other principles based on which RR Appendix **30B** was established by WARC-Orb-88.

Two possible methods to satisfy the agenda item were identified. One method proposes to keep the sequential treatment and the predetermined arc (PDA) concept. The other method proposes to eliminate the PDA concept and to introduce a non-sequential treatment. Detailed analysis on the technical and regulatory issues identified for each method can be found in the following sections.

Approach 1 (sequential processing) provides a regulatory solution wherein submissions are examined in a sequential manner, as today, but include a number of changes in response to many of the other issues identified (see Annex 1.10-1).

Approach 2 (non-sequential processing) provides a regulatory solution wherein submissions are examined in a non-sequential manner and include a number of changes in response to many of the other issues identified (see Annex 1.10-2.).

Options contained in this report, including the texts in Annexes 1.10-1 and 1.10-2, represent the views of certain administrations and were not agreed by administrations attending ITU-R/CPM.

6/1.10/1 Background

A number of difficulties have been raised by administrations in applying the procedures currently contained in RR Appendix **30B**, some of these procedures being not fully transparent vis-à-vis administrations. Moreover, a considerable number of Rules of Procedure have been developed to remedy the deficiencies and/or ambiguities of the current regulatory procedures. Some of these Rules of Procedure, while resolving a difficulty or deficiency, introduced other difficulties or deficiencies. The technical criteria were specified taking into consideration the existing technology in the mid-80s and need to be reviewed given the currently available technology. There is therefore a need to update the technical criteria and remove certain current regulatory deficiencies of RR Appendix **30B** with the aim of improving its usability.

During the studies, it was noted that some provisions of the current RR Appendix **30B** were now obsolete (e.g. § 6.60 of Article 6 of RR Appendix **30B**) or contained typographical errors (e.g. Tables 1 and 2 in Annex 1 of RR Appendix **30B**). In revising the text of RR Appendix **30B**, attempts should be made to identify and amend such cases.

6/1.10/2 Summary of technical and regulatory studies and relevant ITU-R Recommendations

The results of those studies are discussed in the next section.

6/1.10/3 Analysis of the results of studies

In the current procedures of RR Appendix **30B**, the Bureau examines the submissions under Article 6 in the order of receipt and determines if the proposed assignment is compatible with the Plan and the List. Based upon the finding of this examination, it either enters the assignment into the List or returns the submission to the notifying administration after allowing administrations 30 days to obtain compatibility with the Plan and the List. As a consequence of the sequential treatment, the Bureau can only process a limited number of submissions each year (22 in 2005, 14 in 2004 and 11 in 2003). The number of submissions processed each year also depends on the possibility for the Bureau to treat several networks from the same administration simultaneously. On 31 January 2007, there were 100 pending submissions to be processed by the Bureau.

The current procedures, based on sequential treatment as a result of the use of PDA do not allow administrations to know the coordination requirements until the Bureau has examined their submission. They then have to obtain all necessary agreements or make modifications to their technical characteristics within the above-mentioned 30 days, which is causing difficulties to many administrations. The use of the PDA concept with sequential processing has provided some flexibility in accommodating new entries in the Plan and the List. However, it also generates uncertainty for those administrations that are planning to propose the conversion of an allotment.

ITU-R studied two approaches, one based on a sequential processing and the other one on a non-sequential processing.

Under sequential processing, a submission that enters the List and expires after the 8-year regulatory period without being brought into use can prevent many other submissions from staying in the queue. Under non-sequential processing, submissions could stay in the queue and eventually enter the List through a coordination agreement or after the expiration of the assignments that were blocking their access (the administration may have to wait for 8 years before this happens).

It is noted that a number of the options with respect to certain issues contained in one or the other of the approaches would be equally applicable to the other approach.

6/1.10/3.1 Sequential processing

6/1.10/3.1.1 Technical issues

6/1.10/3.1.1.1 Technical parameters

It has been agreed that the aim of this issue is only to update the technical parameters of the allotments in the RR Appendix **30B** Plan in order to adapt them to the current satellite network designs. It was noted that the possible impact of a new set of parameters to the assignments in the List needs to be addressed by transitional arrangements. It was also noted that the possible impact of a new set of parameters to the RR Appendix **30B** networks submitted, but not yet in the List, needs to be addressed by transitional arrangements.

It has been agreed that the scope of the exercise should not be limited to varying a small number of parameters but should simultaneously consider varying several parameters. Variations in the values of the following parameters and their inter-relationship and impact on protection criteria could be considered: carrier-to-noise ratio (taking into account, *inter alia*, BER vs E_b/N_0 and rain attenuation model); earth station antenna elevation angle; interference criteria; earth station characteristics (diameter, receiving system noise temperature, antenna efficiency, reference pattern), space station characteristics (receiving system noise temperature, antenna efficiency, reference pattern). It was agreed that any studies considering different values of the Plan parameters should leave unchanged orbital locations and national coverage and compliance with this requirement has to be verified for any complete set of technical parameters.

However, consideration should be given to the protection of assignments to other services which operate in accordance with the Table of Frequency Allocations and may be affected by the RR Appendix **30B** Plan after the new set of parameters is introduced.

It was agreed that if the technical parameters of the allotments are modified, there is a need to ensure their appropriate protection and possibility for implementation with the new Plan parameters without changing the orbital position and national coverage of allotments. For this purpose, the corresponding *C*/*N* ratio, *C*/*I* ratio and the reference situation for the allotments and the assignments should be recalculated with any new set of technical parameters for the allotments in the Plan*. Failing to do so could lead to a situation where allotments are insufficiently protected with difficulties to be implemented.

Some administrations were of the view that to maintain some degree of homogeneity for networks operating in the frequency bands regulated by RR Appendix **30B**, there should be a range set on the allowed values of the technical parameters for submissions for new networks, including conversion of allotments into assignments, subregional systems and additional uses.

Some other administrations were of the view that it was neither necessary nor appropriate to impose specific limitations on the technical parameters that administrations could submit for prospective new networks as long as the appropriate protection of other allotments and assignments in the Plan and the List was ensured and the notifying administration accepted the interference levels received by use of these parameters.

6/1.10/3.1.1.1.1 *C*/*N*

Future use of the RR Appendix **30B** frequency bands should be based upon utilization of digital modulation only and *C*/*N* requirements should be determined from BER vs. E_b/N_0 considerations. It is noted that systems using analogue modulation are in operation. Various studies looked at practical modem performance for different types of modulation (BPSK, QPSK and 8-PSK) and error correction schemes. Bit-error-rates in the range 10^{-6}–10^{-8} were considered.

The current *C*/*N* values for allotments in RR Appendix **30B** were designed in 1988 so that the worst-case uplink and downlink *C*/*N* were 23 dB and 17 dB respectively. This resulted in a worst-case overall *C*/*N* of 16 dB, i.e. $C/N_{up} = C/N_{overall} + 7$ dB and $C/N_{down} = C/N_{overall} + 1$ dB when both uplink and downlink worst case values are combined. In reviewing the *C*/*N* values, some studies kept this apportioning of the noise between the up- and the downlink while other studies established revised planning parameters based upon total link performance considerations.

* Currently the Bureau does not have all the software tools required for such analyses.

The resulting recommended rain-faded *C*/*N* values are within the ranges given in Table 1.10-1 below. In the event of a reduced *C*/*N*, the transmission capacity in bit/Hz of an individual national allotment in the Plan will be reduced. This would allow a reduction in earth station antenna size and/or transmitters power which will increase the utilization of the RR Appendix **30B** bands.

6/1.10/3.1.1.1.2 Earth station antenna diameter

Several studies have shown that a reduction of antenna diameter would only be possible with an associated reduction of *C*/*I* for the allotments in the Plan. These studies also have shown that an antenna size reduction beyond the range shown in Annex 1 of RR Appendix **30B**, without a relocation of allotments or assignments or a wholesale increase of earth station or space station e.i.r.p. densities would lead to *C*/*I* values which would render implementation of allotments impractical. A possible range of antenna sizes that could be considered is indicated in Table 1.10-1 below.

If the up- and/or downlink e.i.r.p. density levels are increased above the current levels in the Plan, this would lead to a degradation of the reference situation for the assignments in the List.

6/1.10/3.1.1.1.3 Receiver noise temperature

Since the RR Appendix **30B** Plan was developed and adopted, there have been substantial technological advances in the receiver design and the noise temperatures in typical networks today are seen to be considerably below what is contained in the current RR Appendix **30B**. Reduction of noise temperature would lead to increased system margin or reduced power requirements, thus facilitating introduction of other revised technical parameters, e.g. reduced antenna size. In the technical studies presented, noise temperatures in the ranges indicated in Table 1.10-1 below have been used. It is proposed that in updating the technical parameters of RR Appendix **30B**, noise temperatures within these ranges should be considered.

6/1.10/3.1.1.1.4 Earth station antenna pattern

The allotments not converted into assignments have two possible earth station antenna patterns as defined by Tables 1 and 2 in Annex 1 of RR Appendix **30B**. Using the improved pattern of Table 2 in Annex 1 of RR Appendix **30B** would provide an improved flexibility for introduction of other technical parameters and allotments for new ITU Member States. One study showed that this improvement would be noticeable mainly for substantially smaller earth station antenna diameters than those contained in the current RR Appendix **30B** Plan (diameters below 3.5 m and 1.5 m in the 6/4 and 13/10-11 GHz bands, respectively).

It is recommended to systematically apply the reference earth station antenna pattern with an improved side lobe pattern, i.e. Table 2 in Annex 1 of RR Appendix **30B**.

6/1.10/3.1.1.1.5 Space station antenna pattern

The usual space station reference pattern used in RR Appendix **30B** is the pattern in Fig. 1 of § 1.7.2, Annex 1 of RR Appendix **30B**. A fast roll-off pattern may be used when specified by administrations, as indicated in Fig. 2 of § 1.7.2, Annex 1 of RR Appendix **30B**. It is recommended to systematically apply this fast roll-off pattern to allotments not converted into assignments.

6/1.10/3.1.1.1.6 Rain attenuation model

It is recommended that Recommendation ITU-R P.618-8 be used instead of Report ITU-R 564-3, which was the basis for the establishment of the RR Appendix **30B** Plan and is no longer in force.

In using Recommendation ITU-R P.618-8 for recalculating the power of the uplink earth station or the downlink space station of all allotments, there is the need to regenerate the satellite antenna beam characteristics.

The current RR Appendix **30B** is based upon a rain fade model where the maximum uplink and downlink fade is limited to 8 dB. A study concluded that, with this 8 dB limitation to the rain fade model, the availability objectives are not met for many allotments in the Plan today (especially in the case of the 13/10-11 GHz bands). This 8 dB limitation could be removed when calculating the power of new ITU Member States allotments and when recalculating the power of all allotments in the Plan. Attention should be given to the fact that such removal may have consequences on the compatibility between allotments and assignments in some cases.

It is noted that in Annex 1 to RR Appendix **30B** (§ A, Item 1.3), no minimum elevation angle is specified for climatic zone Q. The Bureau informed in this respect that propagation calculations are based on Recommendation ITU-R P.837. It is suggested that zone Q (or the corresponding range of rain rates) be associated with a minimum elevation angle of 40°.

6/1.10/3.1.1.1.7 Possible values of technical parameters

TABLE 1.10-1

Technical parameters for allotments in the RR Appendix 30B Plan

Parameter	Current AP30B value	Possible ranges of new values
Modulation	Independent of modulation	Only digital modulation
$(C/N)\uparrow$, $(C/N)\downarrow$, $(C/N)_{total}$ during faded conditions	23 dB, 17 dB, 16 dB	15.5 ↔ 19 dB, 10 ↔ 13 dB, 8.9 ↔ 12 dB
Availability of C/N objectives	6/4 GHz: >99.95% of year* (rain margin = 8 dB) 13/10-11 GHz: >99.9% of year* (rain margin = 8 dB)	No change or 6/4 GHz: >99.9% of year* 13/10-11 GHz: >99.8% of year*
Rain fade model	cf. Report ITU-R 564-3	Recommendation ITU-R P.618-8
Margin for gaseous attenuation		Recommendation ITU-R P.676-6
Earth station antenna elevation angle	10° for rain climatic zones A to G 20° for rain climatic zones H to L 30° for rain climatic zones M to N 40° for rain climatic zone P	No change, but adding 40° to be associated with rain climatic zone Q
Earth station characteristics		
Diameter	6/4 GHz: 7 m 13/10-11 GHz: 3 m	6/4 GHz: 3.5 ↔ 5.5 m 13/10-11 GHz: 1.8 ↔ 2.4 m
Reference pattern	AP30B/Annex 1, Table 1 or 2	AP30B/Annex 1, Table 2
Minimum transmit power density	6 GHz band: –60 dBW/Hz 13 GHz band: –60 dBW/Hz	No change or 6 GHz band: –55.5 dBW/Hz 13 GHz band: -56.0 dBW/Hz**
Maximum transmit power density	Not specified	< Minimum transmit power density + 6 dB**
Receiving system noise temperature	4 GHz: 140 K 10-11 GHz: 200 K	4 GHz: 75 ↔ 100 K 10-11 GHz: 110 ↔130 K
Space station characteristics		
Reference pattern	AP30B/Annex 1, Fig. 1 or 2	AP30B/Annex 1, Fig. 2
Receiving system noise temperature	6 GHz: 1 000 K 13 GHz: 1 500 K	6 GHz: 450 ↔ 500 K 13 GHz: 550 ↔ 600 K

* In establishing link parameters, the above availability objectives are to be applied on the up and downlinks independently.

** These values are dependent on the values of other parameters chosen.

6/1.10/3.1.1.2 Protection criteria

The single-entry and aggregate interference criteria in Annex 4 to RR Appendix **30B** are consistent with the single-entry and aggregate interference criteria defined in ITU-R Recommendations in force at the time the RR Appendix **30B** was developed:

– the single-entry interference power level should not exceed 4% of the total noise power level at the input to the demodulator. In other words, the single-entry carrier-to-interference ratio should be 14 dB greater than the carrier-to-noise ratio ($C/I_{se} = C/N_{ref} + 14$ dB);

– the aggregate interference power level should not exceed 10% of the total noise power level at the input to the demodulator. In other words, the aggregate carrier-to-interference ratio should be 10 dB greater than the carrier-to-noise ratio ($C/I_{agg} = C/N_{ref} + 10$ dB).

As $C/N_{ref} = 16$ dB, it implies a single entry interference criterion of 30 dB and an aggregate interference criteria of 26 dB as contained in Annex 4 to RR Appendix **30B**. During WRC-03 those values have been respectively reduced to 27 dB and 23 dB. The protection criteria are closely linked to the values of the technical parameters for allotments.

6/1.10/3.1.1.2.1 Introduction of the coordination arc principle

Appendix 1 to Annex 4 of RR Appendix **30B** provides a method for calculation of the single entry and aggregate *C*/*I* values. Studies have been performed on modifying this method to utilize the coordination arc concept in identifying the networks to be included in that calculation.

Studies on the impact of introducing a coordination arc in these bands concluded that the RR Appendix **30B** was well suited for the introduction of the coordination arc principle. Therefore, it is suggested to introduce a coordination arc of 9° for the 13/10-11 GHz band and of 10° for the 6/4 GHz band such that allotments in the Plan, assignments in the List or assignments received previously by the Bureau (in case the treatment is not sequential) situated outside the coordination arc around the orbital position of a network for which the reference situation is being calculated would not be taken into account in the calculation. There was also a proposal to take account of the networks outside the coordination arc when calculating the aggregate *C*/*I*, but no consensus was reached.

6/1.10/3.1.1.2.2 Power-flux density (pfd) limits to protect networks outside the coordination arc

If the coordination arc concept is introduced, mechanisms to protect allotments and assignments outside the coordination arc would be required and, for this purpose, the introduction of hard pfd limits to protect allotments and assignments outside the coordination arc was preferred to a procedure with comments from administrations and an agreement seeking mechanism.

It was agreed that for the uplink, as well as for downlink pfd hard limits, one common value, or mask, would be applied for all networks. This would encourage networks with homogenous parameters.

Studies including the coordination arc concept consider a hard pfd limit for the uplink. For the downlink, both a pfd mask and a hard pfd limit are considered, with provisions similar to RR No. **21.17** being applicable. A hard downlink pfd limit would need to ensure protection for all locations outside the coordination arc and would thus need to take account the most conservative value, i.e. the value at the edge of the coordination arc. A hard pfd mask would provide a more precise definition of the protection outside the coordination arc, but would require some more examination.

6/1.10/3.1.1.2.3 Use of pfd masks as trigger or hard limits

As single-entry pfd limits are based upon protecting allotments having the lowest or nearly the lowest earth station or space station e.i.r.p. density levels, the single entry pfd limit can only be used to indicate the potential that the single-entry C/I criterion will not be met. As the pfd masks are derived from single-entry C/I values, exceeding the mask will indicate the potential that the single-entry C/I criterion into space stations or earth stations on the uplinks or downlinks respectively will not be met. Given that some earth stations and space stations may operate with higher e.i.r.p. densities, only the calculation of the C/I can be used to definitively establish whether or not the C/I criterion of the Plan have been met. For this reason, one view was that pfd masks can only be used as a trigger and not as a hard limit.

6/1.10/3.1.1.2.4 Aggregate interference criteria[1]

All studies include a protection criterion against the aggregation of all interferers which is based upon an overall aggregate C/I value. One study proposes that the determination of the value of C/I be based upon required system margin considerations and that a value of 22 dB in the 13/10-11 GHz band and 20 dB in the 6/4 GHz band be used. Other studies base the determination of the C/I value on Recommendation ITU-R S.1432 which stipulates that allocated aggregate

[1] WRC-03, in addressing Agenda item 7.1, endorsed the use of 0.05 dB tolerance in the MSPACE calculation as a computation precision.

interference from other FSS services should be 25% of the system noise for victim networks not with frequency re-use and 20% for victim networks with frequency re-use. This would correspond to $C/I_{overall\ agg} = C/N$ + (6 or 7 dB respectively). Two possibilities for the C/N value used for assessing the $C/I_{overall\ agg}$ have been considered:

– the C/N is calculated at each test point with a maximum value corresponding to $C/N_{overall\ reference}$

– the C/N is the $C/N_{overall\ reference}$.

Additionally one of those studies proposes an aggregate C/I tolerance (e.g. 0.45 dB) with respect to test points with an aggregate C/I below the reference value.

6/1.10/3.1.1.2.5 Single entry criteria*

The studies propose different single entry criteria to protect networks in the Plan and the List.

One study "A" proposes separate uplink and downlink single entry C/I values associated to uplink and downlink pfd masks. Those values were derived taking into account the ratio of uplink and downlink earth station antenna gain due to the difference in frequency. The pfd masks were derived taking into account two antenna diameters.

A second study "B" proposes the combination of:

– an uplink single entry C/I based on C/N_{uplink}, which is calculated at each test point using the parameters of the Plan or the List without considering rain attenuation with a maximum of 23 dB (C/N_{uplink} reference value), and

– a downlink pfd mask (see Table 1.10-2 below).

A third study "C" proposes an overall (uplink and downlink) single entry C/I based on $C/N_{overall}$, which is calculated at each test point using the parameters of the Plan or the List without considering rain attenuation with a maximum value equal to $C/N_{overall\ reference}$.

A fourth study "D" proposes the combination of:

– an overall single entry C/I based on $C/N_{overall\ reference}$, and

– pfd masks determined by parameters in the Plan, range of antenna sizes, and $\Delta T/T$ = 6%, and

* WRC-03, in addressing Agenda item 7.1, endorsed the use of 0.05 dB tolerance in the MSPACE calculation as a computation precision.

− Single-entry C/I tolerance (e.g. 0.45 dB) with respect to test points with a single entry C/I below the reference value.

In this study, a network is considered affected if none of the criteria are respected.

6/1.10/3.1.1.2.6 Aggregate and single-entry criteria proposed in the four studies

TABLE 1.10-2

	Current RR Appendix 30B	Study A**	Study B	Study C	Study D
Aggregate protection criteria	$C/I_{overall\ aggregate}$ = 23* dB	$C/N_{threshold}$ = 12 dB and 6/4 GHz band $C/I_{overall\ agg}$ = 20 dB 13/10-11 GHz band $C/I_{overall\ agg}$ = 22 dB	$C/I_{overall\ agg} = C/N_{overall}$ + 7 dB where $C/N_{overall}$ = Min {16 dB, $C/N_{overall\ calculated}$}		$C/I_{overall\ agg} = C/N_{overall\ ref}$ + 6 dB C/I tolerance
Single entry criteria	$C/I_{overall\ single\ entry}$ = 27* dB * For submissions received before 5 July 2003, the values of 26 and 30 dB shall be used for $C/I_{overall\ aggregate}$ and $C/I_{overall\ single\ entry}$ respectively	6/4 GHz band $C/I_{single\ entry\ uplink} = C/I_{overall\ agg}$ + 9.03 dB $C/I_{single\ entry\ downlink} = C/I_{overall\ agg}$ + 5.64 dB 13/10-11 GHz band $C/I_{single\ entry\ uplink} = C/I_{overall\ agg}$ + 7.71 dB $C/I_{single\ entry\ downlink} = C/I_{overall\ agg}$ + 6.41 dB Pfd masks determined by single entry C/I limits	$C/I_{single\ entry\ uplink} = C/N_{uplink}$ + 12.2 dB where C/N_{uplink} = Min {23 dB, $C/N_{uplink\ calculated}$} Downlink pfd mask (Such a mask could be determined by calculation of Min{$C/N_{downlink\ calculated}$ + 12.2 dB; 29.2 dB; $C/I_{downlink\ calculated}$})	$C/I_{overall\ single\ entry} = C/N_{overall}$ + 12.2 dB where $C/N_{overall}$ = Min {16 dB, $C/N_{overall\ calculated}$}	$C/I_{overall\ single\ entry} = C/N_{overall\ reference}$ + 12.2 dB where $C/N_{overall\ reference}$ = 12 dB Uplink and downlink pfd masks (Such a mask could be determined by parameters of the Plan and a $\Delta T/T$ = 6%) C/I tolerance (e.g. 0.45 dB)

** This study also updates the technical parameters of the Plan.

In discussing the above mentioned studies, some administrations were of the view that both single-entry and aggregate *C*/*I* must be used without any tolerance with respect to the allotments. However, in case of assignments not stemming from the conversion of an allotment, a 0.25 dB *C*/*I* tolerance could be used.

6/1.10/3.1.1.3 Macrosegmentation concept

The macrosegmentation concept as described in Annex 3B of RR Appendix **30B** is understood as a rough way of traffic matching in which high density carriers (typically analogue modulation) are arranged in the upper 60% of the band and low density carriers (typically digital modulation) are arranged in the lower 40% of the band. In applying the macrosegmentation concept, submissions for new networks having high density carriers in the lower 40% of the band are required to provide additional protection to other networks in the Plan and the List.

However, as of today, practically all new networks use digital modulation. Moreover, the macrosegmentation concept is applied only with respect to submissions for new networks and any changes will have no impact on any existing network applying analogue modulation.

Administrations are invited to consider a revision of RR Appendix **30B** based upon only digital modulation and to remove the macrosegmentation concept from RR Appendix **30B**. In doing so, care should be taken for those assignments in the List whose protection criteria are modified due to the Macrosegmentation concept.

6/1.10/3.1.1.4 Generalized A, B, C and D parameters

The generalized parameters, A, B, C and D provide tools for the Bureau and administrations to determine if a suggested conversion of allotment is in conformity with the Plan. There is the case where the compatibility with the Plan and the List is met, while the values of one or more of these generalized parameters are exceeded. Protection of allotments and assignments in RR Appendix **30B** is granted through *C*/*I* assessments, regardless of the situation where the values of one or more of the generalized parameters A, B, C and D are exceeded. The MSPACE software allows an easy way to determine if a suggested network meets the required compatibility with the Plan and the List, based on these *C*/*I* assessments. This means that the Bureau does not have to (there is no clear provision in practice to) determine if a suggested conversion of allotment is in conformity with the Plan using the generalized parameters, and full protection of all allotments and assignments in the Plan and the List is ensured without the generalized parameters.

The Bureau informed that it is currently performing technical and regulatory examination in respect to the RR Appendix **30B** without the use of generalized parameters.

The generalized parameters may be of value in transferring assignments in the List back as allotments in the Plan (see § 6/1.10/3.1.2.3.6). It is therefore proposed that the Bureau keep a record of the generalized parameters for the allotments of the Plan and establish generalized parameters for new allotments and publish these in a circular letter.

6/1.10/3.1.2 Regulatory issues

6/1.10/3.1.2.1 Procedures for the processing of submissions

The rights for an FSS GSO network to use RR Appendix **30B** frequency bands are acquired by entering the corresponding assignments in the RR Appendix **30B** List. Five different procedures (Sections I, IA, IB, II and III of Article 6) can be followed in order to enter these assignments in the RR Appendix **30B** List. It is considered that a simplification could lead to less complex regulation and more flexibility to allow use of the spectrum.

Today, suspension of allotment is associated with "subregional systems".

Some administrations were of the view that, if suspension of allotments is to be retained, there is a need for agreement on a clear definition of "suspension of allotments", in particular partial suspension. If a procedure related to "subregional systems" is retained, the relevance of limiting this to "neighbouring countries" needs to be considered as well as a clear definition of what is meant by neighbouring countries.

Some administrations were of the view that the main purpose and objective of additional uses have been misused in terms of number of submissions. There must be a mechanism to control that in order to avoid warehousing of orbital positions. This approach may be required for non-intergovernmental subregional systems.

Some administrations were of the view that submissions which would include additional uses should not be limited to a maximum period of validity of 15 years given that satellites being constructed today have a minimum life expectancy of at least 15 years.

Option 1: Article 6 of RR Appendix **30B** would contain one single procedure for processing of submissions relating to conversion of an allotment with or without changes to its characteristics and of all other submissions. A variant of this method is to also include suspension of an allotment.

Option 2: Article 6 of RR Appendix **30B** would contain two procedures. One procedure concerns submissions relating to the conversion of an allotment without changes to its characteristics and the other procedure concerns all other submissions including conversion of an allotment with changes to its characteristics. Consideration may be given to afford higher priority (in terms of the order of the processing) to the first procedure vis-à-vis the second procedure.

Option 3: Article 6 of RR Appendix **30B** would contain two procedures. One procedure concerns the conversion of allotments with or without changes to its parameters and the other procedure concerns all other submissions. Neither of these two procedures would have any limitation with respect to the period of validity of the network. The latter procedure would not have any limitation with respect to the number of times an administration may apply it.

Option 4: Article 6 of RR Appendix **30B** would contain two procedures. One procedure concerns the conversion of allotments with or without changes to its parameters and the other procedure concerns all other submissions. The latter procedure would imply a limited period of validity for the network (e.g. 15 years) renewable once and could be only applied a given number of times (e.g. 3 times) by the same administration, on its own behalf or as part of a group of named administrations, within any eight-year period.

Option 5: Article 6 would contain three procedures which are the current procedures of RR Appendix **30B** in Sections I (merged with Section IA), II and III of Article 6. Section II (subregional systems) would require the mandatory suspension of the allotments of all Member States taking part in the subregional system. The administration of a country member of the subregional system should indicate which national allotment is to be suspended in this connection (by excluding part of current § 6.39 from the word "… unless …" to the end of the paragraph).

This option will continue to afford the protection of the suspended national allotment.

The above-mentioned conditions should only be applied with respect to the subregional systems submitted under Article 6 but not included in the List before a date to be established by the Conference.

6/1.10/3.1.2.2 New ITU Member States

Currently, a number of new Member States of the Union do not have their own allotments. It has been recognized that such Member States, together with those whose geographical status has changed since the establishment of the Plan, must be given the opportunity to have the same rights as those Member States that were taken into account at the time the Plan was developed and adopted for inclusion in the ITU RR. WRC-07 should take account of the need to accommodate new Member States.

The current provisions in Article 7 of RR Appendix **30B** may not be sufficient to ensure that an administration will be able to find a proper orbital position to be included in the Plan, in particular the need that a new ITU Member State when submitting its requirements for an allotment be asked to coordinate with those networks previously received by the Bureau under Article 6 of RR Appendix **30B**.

The Bureau reported that there are no clear provisions in Article 7 of RR Appendix **30B** allowing the application of the PDA concept by the notifying administration for submissions under that Article, and that it would be useful to improve the procedures of that Article to clearly include this possibility.

Option 1: In order to introduce a new allotment in the Plan, new ITU Member States would use the same procedure as other submissions under Article 6 of RR Appendix **30B** according to the date of receipt.

Option 2: The Administration of a country which has joined the Union as a new Member State should obtain a national allotment in the Plan with the highest priority (in terms of date of receipt) in application of Article 6. For this purpose, upon receipt of the complete information, the information would be treated by the Bureau ahead of any other submissions received under Article 6 except submissions which were under examination by the Bureau at the time of the receipt of the request from the new Member State.

6/1.10/3.1.2.3 Regulatory improvements

The procedures of RR Appendix **30B** have been in use since 1988. In using RR Appendix **30B** procedures, several subjects that may need a clearer understanding have been identified.

6/1.10/3.1.2.3.1 Modifications to assignments in the List

In order to facilitate the use of the related frequency bands, it would be useful to include regulatory procedures allowing administrations to modify their assignments included in the List, since currently no such procedures exist. This would be achieved by modifying the procedures of Article 6 to make them applicable for modifications of assignments in the List, requiring that the modification of assignments in the List apply the procedure of this Article.

6/1.10/3.1.2.3.2 Notification of assignments with characteristics different from those in the List

Regarding the notification of assignments with characteristics different from those contained in the List, there is no clear indication in the procedures of Article 8 of RR Appendix **30B** with regard to the examination of a notice with respect to its conformity with the RR Appendix **30B** Plan and the associated provisions when assignments are notified with characteristics that are different from those entered in the List.

It is noted that notification of assignments with characteristics different from those in the List for recording in the MIFR does not lead to changes of the characteristics in the List. It is also noted that the characteristics recorded in the MIFR are not used in the compatibility analysis made under Article 6 of RR Appendix **30B**.

The Radio Regulations Board has adopted a Rule of Procedure in this respect as summarized in Option 1 below.

Option 1: Notification of assignments in the MIFR with characteristics different from those in the List is possible if the new characteristics do not produce more interference than those in the List.

Option 2: Notification of assignments in the MIFR with characteristics different from those in the List is possible provided that the new characteristics do not produce more interference or need more protection than those in the List.

Option 3: Any notice related to notification of assignments with characteristics different from those in the List shall be given a new date of receipt and apply the procedures of Article 6 of RR Appendix **30B**.

6/1.10/3.1.2.3.3 Splitting allotments or assignments into multiple orbital locations

A Rule of Procedure has been adopted that ensures that the orbital location for national allotments in both the 6/4 GHz and the 13/10-11 GHz bands is common to both bands. Whenever the PDA concept is applied in one of these two band segments, it is simultaneously applied to the other, keeping one single orbital location. Additionally, when an administration applies Article 6 and Article 8 of RR Appendix **30B** for only one of the two band segments, resulting in a change to the size of the PDA for that band segment, the size of the PDA for the other band segment is made to be the same.

If splitting of an allotment at two orbital positions is not allowed, an administration that wants to convert only the 13/10-11 GHz or the 6/4 GHz part of its allotment in a new orbital position will also have to coordinate at the new orbital position the part that is not proposed to be converted. This requirement may forbid the implementation of the allotment at different orbital positions.

If such splitting is allowed only for an administration's own allotment, every split allotment will occupy two orbital positions and the use of the PDA concept, when it is retained and under current provisions in RR Appendix **30B**, may be constrained.

Splitting of allotments or assignments of other administrations is, amongst other things, associated with the application of the PDA Concept.

Some administrations were of the view that splitting of the 800 MHz associated with allotments in two different orbital positions should be forbidden regardless of whether it is the allotment of the notifying administration or of another administration.

Some other administrations were of the view that splitting of the 800 MHz bandwidth associated with allotments in two different orbital positions (through application of Article 6) with either the 6/4 GHz or the 13/10-11 GHz band can only be accepted when it is at the initiative of the administration responsible for the allotment or it is explicitly agreed by the affected administration. This splitting would to some extent enhance the flexibility in implementing the Plan and make it easier to obtain the required compatibility when converting the allotment.

6/1.10/3.1.2.3.4 Use of only Earth-to-space or space-to-Earth allocation covered by RR Appendix 30B bands

The current RR Appendix **30B** does not specify if and how submissions that include only Earth-to-space or space-to-Earth part of the RR Appendix **30B** bands or that include less than the 300 MHz of the 6/4 GHz or less than the 500 MHz of the 13/10-11 GHz band should be processed.

Nevertheless, one "existing system" includes only space-to-Earth frequencies. Therefore, submissions that would be compatible with assignments in the List if limited to the frequency band not present in the "existing system" become incompatible. In other words, spectrum that could be used remains unused because of a regulatory restriction that serves no purpose.

It was agreed to include regulatory text explicitly indicating that additional uses submissions can include only uplink or downlink frequencies in one or both of the bands (6/4 GHz and 13/10-11 GHz).

6/1.10/3.1.2.3.5 Sharing of capacity between two assignments through band segmentation

The Rules of Procedure relating to § 6.12 of Article 6 of RR Appendix **30B** states that two administrations may reach agreement on the shared use of the frequency bands. It also states that "in the compatibility examination by the Bureau, the mutual interference between non-overlapping frequency assignments shall not be taken into consideration in formulating Findings".

Currently the Bureau's compatibility examination can be conducted in the 6/4 GHz band only or in the 13/10-11 GHz band only but not in a subset of the 6/4 GHz band or of the 13/10-11 GHz band. Some of the implications of this limitation were discussed. Therefore, the contents of the Rules of Procedure related to this issue should not be generalized and should not be included in the RR.

6/1.10/3.1.2.3.6 Reinstatement of allotments in the Plan

Clear provisions are needed for the case of an assignment stemming from the conversion of an allotment and not brought into use within the 8 years referred to in § 6.1 of Article 6 of RR Appendix **30B** or if such assignment, after being brought into use, subsequently ceases to be used.

Option 1: Some administrations were of the view that the procedure currently implemented by the Bureau, i.e. reinstatement of the allotment with the same parameters that it had in the List, is the appropriate approach to take. This approach is consistent with the last WRC-03 decision. There may also be a need to consider the situation of assignments that are being transferred to allotments in the Plan when changes in the geographic situation of the country under consideration lead to one or more test points associated with the assignment to fall outside its territory.

Option 2: Some other administrations were of the view that, in order to ensure that the RR Appendix **30B** Plan remains strictly a Plan of national allotments, the transfer of an assignment in the List back to an allotment in the Plan for administrations whose territorial geography has not changed, should be carried out in the following way:

a) the assignments in the List should be deleted;

b) the generalized parameters that defined the initial allotment should be reinstated; and

c) the reinstated allotment shall occupy the orbital location for which the assignments in the List were successfully coordinated.

In the event of changes in the territorial geography of the notifying administration, the administration may initiate the procedures applicable to new ITU Member States to obtain a new national allotment.

Option 3: Some other administrations were of the view that the following should apply:

When an allotment is converted into an assignment in the List, the allotment should be displaced to the orbital position of the assignment in the List (but would keep all other national allotment parameters) and be taken into account together with the proposed assignment in subsequent examination by the Bureau. When the assignment is to be suppressed from the List, the allotment would remain in the Plan and available for future conversion.

It has been discussed whether there is a need to examine if the definition of the PDA for an allotment in the Plan resulting from the transfer of an assignment, as described above, would have to be revisited in the case the orbital location of the newly created allotment differs from that of the allotment that originated the assignment being transferred. No conclusion was reached.

6/1.10/3.1.2.3.7 Alignment of RR Appendix 4 data for submissions under Articles 6 and 8 of RR Appendix 30B

The possibility of aligning the RR Appendix **4** data submitted under Articles 6 and 8 of RR Appendix **30B** has been considered, acknowledging that such an alignment would reduce the workload of the Bureau and of administrations. However, the need to submit identical data elements at the stages of Article 6 and Article 8 of RR Appendix **30B** has yet to be confirmed.

Additionally, if such alignment is implemented, when the notified characteristics of the assignment are exactly the same as those in the List, the notifying administration may just send a letter of the notice under Article 8 to the Bureau without the RR Appendix **4** database which is already recorded in the List.

6/1.10/3.1.2.3.8 Pfd examination at the stage of application of Article 6 of RR Appendix 30B

Currently, in Article 6 of RR Appendix **30B**, there is no provision instructing the Bureau to perform an examination with respect to the other provisions of the RR, in particular the pfd limits in RR Article **21**, but it is done at the stage of notification under § 8.8 of Article 8 of RR Appendix **30B**. Therefore, in the current regulations, it is possible to enter in the List an assignment which is not compliant with pfd requirements.

In order to avoid performing such an important examination only at a later stage when processing submissions under Article 8 of RR Appendix **30B**, it has been agreed that the pfd limits in RR Article **21** should be examined during the processing of Article 6 submissions. However, in the case of sequential processing such examination should not add an additional adjustment period of 30 days to the one provided for seeking the necessary agreements or modifying the characteristics of the proposed assignment.

Some regulatory text indicating to the Bureau to examine an assignment proposed under Article 6 of RR Appendix **30B** with respect to § 8.8 of Article 8 of RR Appendix **30B** could be included in Article 6 of RR Appendix **30B**.

6/1.10/3.1.2.3.9 Comments on information published in the BR IFIC

Section 6.50 of Article 6 of RR Appendix **30B** provides a “commenting period” of 45 days associated with the Special Section related to “subregional systems” in the BR IFIC. The comments made under § 6.50 are limited to “an administration believing that the agreed protection criteria have not been met”. During the process of the submissions under Article 6 of RR Appendix **30B**, the Bureau delays the examination of the following submission for 45 days. No other “commenting period” is applied in any other cases within RR Appendix **30B**.

Some administrations were of the view that the “commenting period” and § 6.50 should be eliminated and should not be reproduced elsewhere in the provisions of Article 6 of RR Appendix **30B**.

Some other administrations were of the view that the “commenting period” should not be eliminated but that it might be possible to reduce it to 14 to 30 days.

If periods for commenting were to be introduced for procedures or sections for which there are no such commenting periods in RR Appendix **30B** further reduction in the processing rate of the Bureau of submissions under RR Appendix **30B** would be introduced. For procedures allowing examination of submissions in a non-sequential manner, a commenting mechanism would not have an impact on the Bureau's capacity of processing submissions.

6/1.10/3.1.2.4 PDA at various stages of development

6/1.10/3.1.2.4.1 PDA at pre-design stage

Some administrations were of the view that, in the pre-design stage, the PDA should be equal to the service arc. Under this scenario there might be a need to revisit the definition of the service arc and include it in Article 2 of RR Appendix **30B**.

Some other administrations were of the view that, in the pre-design stage, the PDA should be the intersection of a fixed arc of ±10° with the service arc.

6/1.10/3.1.2.4.2 PDA at design stage

There was consensus that the design stage should start as soon as the RR Appendix **4** information reaches the Bureau independent of any receivability analysis.

As for the size of the PDA to be associated with allotments at this stage, there were views in support of ± 5° (like today) because of the flexibility obtained for applying the PDA concept, while other views were in support of 0° since having the orbit location changed after the submission could create difficulties in the satellite design, e.g. if the satellite was to contain capacity from other frequency bands (where submissions are for one specific orbit location) or if the satellite was to be co-located with another operational satellite.

6/1.10/3.1.2.4.3 PDA for assignments in the List

There was consensus that the PDA should be 0° when the assignment enters the List.

6/1.10/3.1.2.5 Service and coverage areas

Currently, RR Appendix **4** data for submissions under Article 6 of RR Appendix **30B** include the characterization of the service area as "identified by a set of a maximum of twenty test points and by a service area contour on the surface of the Earth or defined by a minimum elevation angle". Within RR Appendix **30**, this is the area in which the administration responsible for the service has the right to demand that the agreed protection conditions be provided. The allotments of the Plan are provided with a national service area protected by a number of up to ten test points. In the process of their conversion into assignments, § 6.4 of Article 6 of RR Appendix **30B** prohibits the extension of the service area to a multinational service area.

On the contrary, the concept of coverage area is not defined in RR Appendix **30B**, in RR Appendix **4** or in Article **1** of the RR. In Annex 5 of RR Appendix **30**, coverage area is defined as the "area on the surface of the Earth delineated by a contour of a constant given value of power flux-density which would permit the wanted quality of reception in the absence of interference".

RR Appendix **30B** is based on national allotments. For any subregional systems or additional uses whose service area extends beyond the national territory of the notifying administration, the Bureau examine whether the notifying administration provides the agreements of administrations whose territories are partially or totally included in the service area contour or on which a test point is located when the filing is examined with respect to its receivability (less than one year after the receipt of the filing) in accordance with the Rules of Procedure under § 2.6 of Article 2 and § 6.38 of Article 6 of RR Appendix **30B**.

Option 1: Some administrations were of the view that the agreement of administrations whose territories are partially or totally included in the service area under § 2.6 of Article 2 of RR Appendix **30B** should no longer be required for the following reason:

Even in the absence of an agreement from Administration A because of inclusion of its territory in the service area, agreement of Administration A will still be required if any of its allotments or assignments is affected by the submission. Moreover, terrestrial systems in the territory of Administration A are protected by the need to comply with the power flux density limits in RR Article **21**.

Option 2: Some other administrations were of the view that the agreement under § 2.6 of Article 2 of RR Appendix **30B** is not a technical agreement but an administrative agreement. Therefore it should be obtained in addition to the technical agreement when required due to the following reasons:

– Future use of the spectrum in the RR Appendix **30B** bands might be restricted which will adversely impact the expansion of the radiocommunication systems in the countries where the agreement was required.
– Existence of test points in the territory of a country whose agreement is required obliges that administration to protect the satellite network of the notifying administration.

Option 3: Some other administrations were of the view that the agreement of administrations whose territories are partially or totally included in the service area should only be required when a test point is situated in that territory.

Option 4: Some other administrations were of the view that definition of the service area could be according to the way it is currently done in RR Appendix **30**. That is, agreement with any administration being included in the service area is implicitly assumed. However, any administration can at any time during the coordination period or after the network has been entered into the List, remove its own territory from the service area of the network. Words similar to RR No. **23.13C** could be included in RR Appendix **30B** to this effect.

Option 5: Some other administrations were of the view that definition of the service area could be according to the way it is currently done in RR Appendix **30** with some modifications. That is, agreement with any administration being included in the service area is implicitly assumed, unless it has objected to this inclusion during the 4-month commenting period. This period would be extended if the assistance of the Bureau has been requested, in the same way as under RR Appendix **30**. In the case of an objection, the territory of the concerned administration would be excluded from the service area, and the notifying administration would provide the new space station antenna diagrams to the Bureau, as modified in order to exclude the territory of the objecting administration, without changing the date of receipt of the submission.

In the event a definition of coverage area is included in RR Appendix **30B**, two different views were expressed:

– One view was that service area and coverage area should be kept as independent concepts and that, even if agreements are required from administrations included in the service area, they should not be required from administrations in the coverage area.

– Another view was that an administration should always have the right to request its exclusion from the coverage area associated with any submission under Article 6 of RR Appendix **30B** and that the coverage area should be close to the service area to the extent technically possible as stated in RR No. **15.5**.

Some administrations were of the view that it would be useful to develop a definition for service and coverage area to be included in RR Appendix **30B**.

6/1.10/3.1.2.6 "Existing systems"

At the time that the FSS Allotment Plan was adopted, there was a collection of satellite networks that had already been filed in these frequency bands. For these "existing systems", Part B of the RR Appendix **30B** Plan was established. No new networks can be entered into Part B of the RR Appendix **30B** Plan.

It has been confirmed by the Bureau that all of these "existing systems" have been either entered in the RR Appendix **30B** List and brought into use (as well as notified and recorded in the Master Register) or have been cancelled. Part B of the Plan has therefore been emptied.

Section IB of Article 6 of RR Appendix **30B** which contains the procedure for recording in the List of the "existing systems" contained in Part B of the Plan is therefore no longer necessary and can be suppressed.

It is also noted that under the current RR Appendix **30B**, "existing systems" listed in Part B of the Plan may continue in operation until 16 March 2010 (20 years after the entry into force of RR Appendix **30B** (WARC-Orb 88)).

There is no provision in RR Appendix **30B** describing what should be done after 16 March 2010.

It was agreed that it would be neither appropriate nor practical to abruptly discontinue on this date the operation of all “existing systems” in the List, in particular those in which either the uplink or downlink stands from an additional use or other networks in unplanned bands. In this respect, there was consensus that a regulatory solution, such as application of the concept of Resolution **4 (Rev.WRC-03)**, may be sought and implemented in order to address this matter consistently with the basic principles of the RR.

Option 1: Suppression of the remaining “existing systems” from the List of RR Appendix **30B** on 16 March 2010. However, a new Resolution would enable administrations to extend the period of validity of the “existing systems” in the List beyond 16 March 2010 under the condition that the parameters of those systems are not modified and that the new proposed period of validity does not extend the initial notified period of validity.

Option 2: Suppression of § 9.2 of Article 9 of RR Appendix **30B** and any reference to “existing systems” in RR Appendix **30B**. A Resolution would also enable administrations to extend the notified period of validity of “existing systems”.

Option 3: Removal of the restriction of operation of “existing systems” beyond 16 March 2010 by suppression of § 9.2 of Article 9 of RR Appendix **30B** as well as any reference to “existing systems” in RR Appendix **30B** without deletion of those systems from the List nor changes to the reference situation.

Option 4: Removal of the restriction of operation of “existing systems” beyond 16 March 2010 by suppression of § 9.2 of Article 9 of RR Appendix **30B** as well as any reference to “existing systems” in RR Appendix **30B** without deletion of those systems from the List nor changes to the reference situation. “Existing systems” would then have reduced protection relative to other RR Appendix **30B** systems. However the matter needs further studies.

Option 5: Suppression of § 9.2 of Article 9 of RR Appendix **30B** and adoption of a Resolution by WRC-07 whereby all “existing systems” are given the opportunity to extend their notified period of validity to 42 months from the closing date of WRC-07. If the administration wishes to extend the period of validity of the assignment beyond the 42-month period from the closing date of WRC-07, it should inform the Bureau accordingly more than three years before the expiry of the period in question. If the characteristics of the assignment remain unchanged the Bureau shall amend as requested the period of validity of the assignment originally recorded in the Master Register. The Resolution would enable individual notifying administrations, if they wish, to take the necessary actions according to the RR concerning the period of validity of these systems.

Option 6: Suppression of § 9.2 of Article 9 of RR Appendix **30B** and adoption of a Resolution by WRC-07 whereby all "existing systems" are given the opportunity to either extend their notified period of validity of the assignment up to 36 months from the closing date of WRC-07 or to extend the period of validity of the assignment under procedures such as in Resolution **4 (Rev.WRC-03)**. However, the following conditions shall also apply:

a) The extension can only be applied once,

b) The extension of the period of validity cannot be longer than the period of validity notified and recorded in the MIFR.

6/1.10/3.1.2.7 Coordination between FSS earth stations (receiving and transmitting) on the one hand, and terrestrial stations, on the other hand, in the RR Appendix 30B frequency bands

In RR Appendix **30B**, there are receiving earth stations (downlink) and transmitting earth stations (uplink); the coordination of both types with respect to terrestrial stations needs to be addressed. Some administrations were of the view that no change to the RR is required. Some other administrations were of the view that changes to the RR are required to appropriately address the current deficiencies. Several views were expressed on this issue:

First view

Some administrations were of the view that currently, typical receiving earth stations in the downlink part of RR Appendix **30B** are not protected by any provisions in the RR from transmitting terrestrial stations. Moreover in case of aircraft stations, there are no clear provisions to cover this case as well. The relationship between the uplink part of the Plan (transmitting earth stations) and the receiving terrestrial stations is only established at the time of notification. It is therefore necessary to establish coordination procedures to protect uplink and downlink earth stations in RR Appendix **30B**. These administrations considered that:

a) there are no provisions in RR Article **9** to protect the receiving earth stations (downlink);

b) the protection of the transmitting earth station (uplink) from the moment of notification does not adequately protect these transmit earth stations. Before notification, these transmitting earth stations are not protected at all;

c) the criteria to be used in RR Appendix **7** to implement the procedure under RR Nos. **9.17** and **9.18** are missing.

Thus, under current RR provisions frequency assignments to terrestrial services can be recorded in the Master Register without being coordinated with planned earth stations of RR Appendix **30B** Plan networks. This may result in a situation when in the process of conversion of RR Appendix **30B** Plan allotments into assignments the terrestrial services (in particular aeronautical) of bordering states may claim protection, thus constraining substantially (or totally blocking) the usage of FSS earth stations resulting from RR Appendix **30B** Plan.

RR Nos. **9.15**, **9.17** as currently contained in the RR do not adequately and properly meet the requirement of protection of receiving earth station and transmitting earth stations of RR Appendix **30B** (see wording of RR Nos. **9.15** and **9.17**). RR No. **9.19** relates to transmitting terrestrial or FSS earth station vis-à-vis BSS non-planned bands (see RR No. **9.19**).

Taking into account that RR Appendix **30B** networks should be protected at any stage of their implementation, it is necessary to establish a coordination procedure which enables protection of Appendix **30B** Plan networks from terrestrial services.

The approach to establish coordination procedures in this case could be the following:

1) Add a coordination requirement in Article **9** of the RR similar to RR No. **9.19** which enables coordination of terrestrial services with FSS typical earth stations in RR Appendix **30B** Plan:

ADD

9.19*bis* …) for any transmitting or receiving station of a terrestrial service allocated with primary status, with respect to typical earth stations included in the service area of a space station in the fixed-satellite service in the frequency bands of Appendix **30B**.

2) Supplement RR Appendix **30B** with an additional coordination procedure similar to coordination procedures of Article 6 of RR Appendices **30**/**30A**.

The case of possible interference to station of terrestrial services from implemented Appendix networks may be covered by corresponding agreements reached between administrations planning to implement assignments for terrestrial stations in RR Appendix **30B** Plan frequency bands and administration responsible for affected RR Appendix **30B** assignments/allotments as a result of application of the proposed coordination procedure. Therefore, no coordination provisions are required for the protection of terrestrial services from implemented Plan networks.

Second view

Some administrations were of the view that the most problematic (in relation to probable limitations on implementation of RR Appendix **30B** Plan assignments) situation is sharing between RR Appendix **30B** Plan typical earth stations and aircraft stations in the 4 500-4 800 MHz, 6 725-7 025 MHz and 12.75-13.25 GHz frequency bands. That is due to more stringent requirements for protection of the aircraft stations and to a large area of mutual interference effect. The problems of sharing between the typical earth stations and land/maritime stations in terrestrial services seem less complicated and they could be solved on a bilateral basis by geographical separation of the stations taking into account actual terrain features, underlying surface, antenna selectivity, polarization, etc.

According to this view, for the protection of typical earth stations, additional provisions are required. Examples of new provisions No. **9.19***bis* of RR Article **9** and Article 8*bis* of RR Appendix **30B** are provided in Annex 1.10-1 (also applicable to the example text in Annex 1.10-2).

Third view

Some administrations stated that the RR Appendix **30B** bands are allocated on a co-equal primary basis between space and terrestrial services, including the mobile service. Currently the RR are very specific on how this coordination should be done (see RR Appendix **30B,** § 8.18) which states that "No provision of this Appendix shall be considered as modifying the requirements of RR Article **9** relating to coordination between earth stations in the fixed-satellite service and stations of terrestrial services sharing the planned bands on an equal primary basis."). This means that the current coordination provisions of RR Nos. **9.17** and **9.18** apply. Coordination under these provisions is a bilateral process, can begin at anytime, and the status of the coordinated earth stations is dependent on the results of the bilateral coordination. The allocations to the FSS at WARC-79 were based on the FSS earth stations coordinating under the equivalent provisions of RR Nos. **9.17** and **9.18**. RR Appendix **30B** does not give any status to typical earth stations that could be associated with the allotments of the Plan. Since RR Nos. **9.17** and **9.18** are limited to specific earth stations, an administration can only protect RR Appendix **30B** earth stations at specific locations. But, if assignments to typical RR Appendix **30B** earth stations were allowed to be coordinated, the result would be that the FSS would pre-empt the spectrum resource against other co-primary services allocated in the bands and would change the intent of the original allocation. In accordance with this view, no change to the RR is required to accommodate this issue. In summary, the administrations supporting this view were of the opinion that the present provisions of Article 8 of RR Appendix **30B** as well as the provisions of Article **9** of the RR provide procedures for the coordination of earth stations and terrestrial stations and no changes to the RR are necessary.

6/1.10/3.1.2.8 Test points in RR Appendix 30B

It has been noted that the allotment of one administration received nine instead of ten test points during WARC-Orb-88. There was agreement that it would be more appropriate not to generalize this case but treat it as a specific case, i.e. to allow that Administration to add one test point inside its national territory and to examine the compatibility with the RR Appendix **30B** Plan and the RR Appendix **30B** List as a consequence of that addition.

There was a view that in the specific situation being addressed in this section, addition of one test point to the Allotment Plan would not be considered as a Plan modification if it is located within the national territory of the subject administration and without changing the characteristics of the allotment (e.g. beam size and antenna pattern).

6/1.10/3.1.2.9 Test points with shaped beam antenna diagrams

With respect to the shaped beam antenna diagram and its relation with the test points, the protection of the service area of allotments in the Plan and assignments in the List is currently guaranteed by a set of test points. Account should be taken of the deficiencies currently encountered by the Bureau when processing certain submissions under RR Appendix **30B**. These are:

– It was brought to the attention of WRC-03 by the Bureau that some submitted space station-shaped beam antenna diagrams contained a number of holes (very low gain in a small area) towards certain specific test points. The Conference did not take any clear action on the matter.
– In order to properly protect allotments in the Plan and assignments in the List, it would be useful to consider the effectiveness of a very limited number of test points to protect large service areas.

This issue needs to be properly addressed.

6/1.10/3.2 Non-sequential processing

The analysis and options of the following Sections are also valid for this method and include, among others:

– Section **6/1.10/3.1.1**: Technical issues;
– Section **6/1.10/3.1.2.1**: Procedures for the processing of submissions;
– Section **6/1.10/3.1.2.2**: New ITU Member States;
– Section **6/1.10/3.1.2.3.1**: Modifications to assignments in the List;
– Section **6/1.10/3.1.2.3.2**: Notification of assignments with characteristics different from those in the List;
– Section **6/1.10/3.1.2.3.4**: Use of only Earth-to-space or space-to-Earth allocation covered by RR Appendix **30B** bands;
– Section **6/1.10/3.1.2.3.5**: Sharing of capacity between two assignments through band segmentation;
– Section **6/1.10/3.1.2.3.7**: Alignment of RR Appendix **4** data for submissions under Articles 6 and 8 of RR Appendix **30B**;
– Section **6/1.10/3.1.2.3.8**: Pfd examination at the stage of application of Article 6 of RR Appendix **30B**;
– Section **6/1.10/3.1.2.5**: Service and coverage areas;
– Section **6/1.10/3.1.2.6**: Existing systems;

– Section **6/1.10/3.1.2.7**: Coordination between FSS earth stations (receiving and transmitting) on the one hand, and terrestrial stations, on the other hand, in the RR Appendix **30B** frequency bands;
– Section **6/1.10/3.1.2.8**: Test points in RR Appendix **30B**;
– Section **6/1.10/3.1.2.9**: Test points with shaped beam antenna diagrams.

The options identified under § 6/1.10/3.1.2.3.6 Reinstatement of allotments in the Plan are also valid for this method. However, the consideration on the PDA concept would not be valid.

The remaining explanations for the non-sequential processing method are given in various places in Annex 1.10-2, under the heading **Reasons**.

6/1.10/4 Methods to satisfy the agenda item

Two principle regulatory approaches with associated technical parameters and criteria to satisfy the agenda item were identified.

A number of options for various issues associated with the two approaches were identified and have been discussed in the subsections of § 6/1.10/3 above.

6/1.10/4.1 Description of the two approaches

6/1.10/4.1.1 Sequential processing of submissions

The current procedures of RR Appendix **30B** are based upon sequential processing of submissions. By sequential processing of submissions, it is here understood that the Bureau, in examining the submissions in the order of receipt, determines if the proposed assignment is compatible with the Plan and the List. Based on the result of this examination, the Bureau either enters the assignment into the List and updates the reference situation, or returns the submission to the notifying administration, most likely after allowing administrations a time period (e.g. 30 days like today) to obtain compatibility with the Plan and the List (e.g. through modification of parameters, bilateral coordination or application of the PDA concept). The PDA concept, under which the orbital positions of the submitted networks and of allotments may be changed, necessitates sequential processing due to the fact that the orbital locations for allotments would not be certain until after the entire procedure of Article 6 has been completed for previous submissions. The Bureau starts processing the next submission after the completion of the Article 6 procedure by the previous submissions (*sequential processing*).

6/1.10/4.1.2 Non-sequential processing of submissions

Non-sequential processing of submissions is analogous to the current processing of RR Appendices **30/30A**. By non-sequential processing of submissions, it is here understood that the Bureau, in examining the submissions in the order of receipt, determines the coordination requirements and publish them in a Special Section. After that and without waiting for the results of the coordination, the Bureau will start the examination of the following submission. The notifying administration has up till the end of the regulatory period (eight years) of the submission to complete the bilateral coordination with all the identified administrations or modify its technical parameters to render the administrations unaffected by the submitted network. At the successful completion of this process, the Bureau will enter the submitted assignment into the List, regardless of the initial order of receipt of the submissions, and update the reference situation. Where it is not possible to obtain compatibility or obtain agreements otherwise, the Bureau either returns the notice or may do otherwise as agreed by the Conference.

6/1.10/4.2 Examples of regulatory text

Examples of regulatory text for a possible revision of RR Appendix **30B**, based upon sequential processing and non-sequential processing of submissions are contained in Annexes 1.10-1 and 1.10-2 respectively for information in order to enable the reader to have an overall view on each approach from technical and regulatory point of view.

These texts have been developed within the framework of ITU-R, but have not been subject to detailed consideration or discussions and are based upon contributions from a limited number of administrations. They do therefore not necessarily represent the views of all administrations.

Moreover, to enhance the readability of the texts and focus on the differences between the two principle solutions, the example texts do not include all the options that are identified in the subsections of § 6/1.10/3 above. This does not imply any preference for any particular option on these issues.

6/1.10/4.3 Advantages and disadvantages of the two approaches

Sequential processing of submissions

Advantages:

– The sequential processing of submissions gives a situation with only one network under coordination at any given time and an update of the reference situation for the Plan and the List at the completion of the coordination of each network. The reference situation of the Plan and the List is the same at the time the Bureau determines the coordination requirements and at the time the proposed assignment is to enter in the List thus, providing a clear interference description and level of protection for allotments and assignments.

– The use of the PDA concept may provide flexibility for an administration to obtain compatibility with the Plan and the List.

Disadvantages:

– A consequence of the sequential treatment is that the Bureau can only process a limited number of submissions each year which may lead to a large backlog.

– The procedures based on sequential treatment do not allow administrations to know the reference situation until the time the Bureau examines their submission. Administrations have a very limited time period (e.g. 30 days, like today) from the moment they receive the result of the examination of their submissions by the Bureau to obtain all necessary agreements or make modifications to their technical characteristics and submit them to the Bureau.

– The use of the PDA concept by other administrations generates uncertainty with regard to the exact orbital position of the allotment of those administrations that are planning to propose the conversion of an allotment into an assignment.

Some administrations were of the view that the first above-mentioned disadvantage is of a temporary nature to some extent and could be alleviated by appropriate measures such as the total suppression or reduction of the commenting period to the minimum necessary time (1 or 2 weeks), putting a limit on the number and period of validity of the submitted assignments, self-regulations after some years (similar to those that happened for RR Appendices **30** and **30A** submissions up to now).

Non-sequential processing of submissions

Advantages:

– The non-sequential processing of submissions would allow examination of a submission to start before a decision is made on whether previous submissions can enter the List or not and it would increase the number of submissions that can be examined by the Bureau in a given period of time.

– Administrations have certainty about the exact orbital position of allotments.

– Administrations have the coordination requirements identified and are given up to the expiry date (e.g. eight years after the receipt of the submission) to obtain all necessary agreements or make modifications to their technical characteristics.

Disadvantages:

– By processing one submission before the completion of the coordination of the previous, there will be numerous submissions under coordination at the same time. This creates uncertainty with respect to the protection of allotments and assignments.

– With non-sequential processing of submissions, the PDA concept which may provide flexibility for administrations to obtain compatibility with the Plan and the List cannot be applied.

– Under non-sequential processing, the submission, if it is under coordination for a long period of time or never successfully completes coordination, may delay the completion of coordination for later submissions (e.g. up to eight years).

– When, in the process of coordination, some parameters of the system are changed, there may be a need for a subsequent step of coordination.

– The transitional arrangements may be complicated.

Some administrations are of the opinion that the following should be taken into account. Some of these issues may have been covered in the above text but they are reproduced here for easy reference.

The basic objectives of the establishment of the RR Appendix **30B** Plan were:

1) To provide a guaranteed orbit/spectrum access to the developing countries, in an equitable manner, which may not be in a position to use the non-planed bands in the FSS, due to various well-known reasons.

2) To limit the scope of the Plan to a national coverage with some exceptions, where some administrations conclude an agreement among themselves to share their orbital/spectrum resources in the Plan and establish subregional systems on an economical and cost effective basis and/or to apply for additional uses under certain conditions as established in RR Appendix **30B**.

3) To use the most appropriate interference criteria for the identification of affected administrations. They were the following:

   3.1) Single-entry *C*/*I* criteria which establish the relation between the incoming interfering signal and the existing interfered with signal, on a one to one basis;

   3.2) Aggregate *C*/*I* criteria which establish the relation between the incoming interfering signal as well as all other interfering signals and the existing signal, on a cumulative basis to indicate the overall effects of all interfering signals.

Both these criteria were to be met together to give the clearance that the incoming signal neither on a one to one basis nor on a cumulative basis produces interference beyond those established by WARC-Orb-88.

4) Moreover these two criteria were to be met without any margin/tolerance.

5) Should the interference occur to an existing signal, the explicit and not tacit (no reply constitutes agreement) agreement of the affected administration(s) is to be obtained.

6) Should the establishment of a subregional system and/or additional uses cover the territory of other administrations, the explicit agreement of these other administrations is to be obtained irrespective of whether or not their allotments in Plan or their assignments in the List are affected.

7) The initial Plan was a national allotment Plan with the possibility of the establishment of subregional systems and/or additional uses under certain restrictive conditions enshrined in the Appendix. Today, none of these conditions are properly met. It is noted that the number of subregional systems and additional uses has dramatically increased. SNL and document CPM07-2/64 indicate that more than 25 subregional systems are in the RR Appendix **30B** List from one single organization. Similarly, more than the same amount of subregional systems from only a few administrations/regional organizations are in the waiting list to be processed. As far as the additional uses are concerned, there are many networks submitted by very few administrations whereas the initial purpose of the additional uses was totally different. Consequently, there must be a clear rule to limit the application of these subregional systems and additional uses coming from a handful of administrations.

8) Consequently, the principle of imposing a limitation on the number of application for subregional systems and/or additional uses must be introduced in order that the number of multiple applications of subregional systems and/or additional uses by a single administration in a limited period be considerably reduced and no warehousing of orbit/spectrum be practiced.

9) The allotments were established in such a manner that their respective administrations would have the ability to easily convert them into assignments.

10) There were sufficient margins in the Plan in terms of established *C*/*I* compared to actual required *C*/*I* in such a way that administrations responsible for allotments would have sufficient margins to reduce their antenna diameters or other criteria for the conversion of their allotments into assignments.

11) If the existing 27 dB single-entry *C*/*I* and the 24 dB aggregate *C*/*I* criteria were reduced to lower values, like 24 dB and 21 dB, the developing countries would never be able to convert their allotments into assignments with antenna diameters smaller than 7 and 3 m for the 4/6 and 10-11/13 GHz bands.

    Until these situations are clarified and the problems are resolved, these administrations are of the view that it is useless to talk about any other issue.

Sequential approach

With respect to the sequential and non-sequential approaches:

1) These two approaches must be clearly and fully described.
2) The advantages and disadvantages of each approach must also be described.
3) The reasons for choosing the non-sequential approach must be explained.
4) The difficulties/disadvantages of the sequential approach stem from several factors as follows:
    - 4.1) The considerable number of submission received (more than 60 out of 100 in the waiting list were submitted between May-December 2005 in order not to be subject to cost recovery established by Council 2005 in its modified Decision 482).
    - 4.2) The current 45 days of commenting period during which the Bureau cannot take up the subsequent network from the list of submissions awaiting examination.
    - 4.3) The concept of examination in sequence which implies that the Bureau should not make a multiple examination for several networks in a manner like RR Appendices **30** and **30A**.
    - 4.4) The 30-day adjustment period provided under Rules of Procedure enabling administrations to make necessary adjustment or obtaining agreement before the incompatible network is returned to the administrations concerned.

    Problems identified in § 4.1 and 4.2 above can easily be resolved for the following reasons:

a) The recourse to be exempt from cost recovery is now over. Consequently, the problem is of a temporary nature and should not be generalized. Moreover, if the principle of imposing a limitation on the number of applications for subregional and/or additional use mentioned above is implemented, the number of multiple applications will be considerably reduced.

b) The commenting period could be reduced or eliminated in such a way that the Bureau does not need to wait 45 or *x* days before taking up the next network from the waiting list but immediately start the examination of the subsequent network. However, should an administration make any comment with respect to the previous network, the Bureau should examine the case and take necessary action as appropriate.

c) The issue of § 4.3 above is a positive course of action and was extensively discussed at WARC-Orb-85 and adopted as one of the most useful tools for the processing and implementation of RR Appendix **30B** and thus must be maintained.

d) The 30-day grace period provided under Rules of Procedure for the adjustment of technical criteria and resolution of incompatibility is a useful tool since it enables administrations to make necessary adjustment or obtaining agreement before the incompatible network is returned to the administrations concerned.

Non-sequential approach

This approach is suggested based on the current concepts of processing of the submissions under RR Appendices **30** and **30A**.

However, there are several deficiencies and shortcomings under this approach as practiced under these two Appendices:

1) At the stage of application of Article 4 of RR Appendices **30**/**30A**, under Part A where network “B” received by the Bureau after network “A” which successfully completes the procedure of Article 4 of RR Appendices **30**/**30A** and is recorded in the Plan or in the List, according to the case, taking into account that network “A” which has been received before “B” was not expected to coordinate with network “B” and now that network “B” is recorded in the Plan or in the List, according the case, no coordination was carried out from “A” to “B”. Consequently, if at the later stage network “A” also successfully completes the procedure of Article 4 of RR Appendices **30**/**30A** and is recorded in the Plan or in the List, according to the case, network “A” could cause interference to network “B”. This issue was reported to various WRCs but no solution was found.

2) At the stage of application of Article 4 of RR Appendices **30**/**30A**, under Part B where network “B” received by the Bureau after network “A” which successfully completed the procedure of Article 4 of RR Appendices **30**/**30A** by modifying one or several of its data elements and was thus recorded in the Plan or in the List, according to the case,

taking into account that the modified data elements of this network have not been coordinated with network "B" received after network "A", and also taking into account that network "B" may also successfully complete the coordination procedure of Article 4 of RR Appendices **30**/**30A** and be recorded in the Plan or in the List, according to the case, these recorded networks which have not done any coordination (i.e. network "A", as modified, and network "B") could thus cause interference to each other.

3) If a network is cancelled, the reference situation is updated but the coordination requirement is not recalculated.

4) If a reference situation of a given network is decreased beyond certain negative value due to the use of EPM or OEPM that network will no longer be identified as unaffected due to the very low protection margin.

Consequently, if WRC-07 decides to opt for the non-sequential approach to be used for the processing of the submission under Article 6 of RR Appendix **30B**, it is absolutely necessary:

a) to take the most realistic and protective approach which duly safeguard the rights of the incumbent networks; and

b) to remove the deficiencies that currently exist in non-sequential approach.

Annex 1.10-1

Example regulatory text for changes to RR Appendix 30B under the sequential approach

This Annex contains an example of regulatory text that does not represent the views of all administrations and does not include all the options that are identified in the CPM text. See also § 6/1.10/4.2.

NOC

ARTICLE 1

NOC

Objective of the provisions and associated Plan

NOC

1.1

MOD

1.2 The procedures prescribed in this Appendix shall in no way prevent the implementation of assignments in conformity with ~~Part A of~~the allotments of the Plan.

NOC

ARTICLE 2

NOC

Definitions

NOC

2.1

MOD

2.2 *Plan:* The Plan for the fixed-satellite service in the frequency bands contained in this Appendix, consisting of~~ two parts:~~

~~*a)* Part A, containing the~~ national allotments~~;~~

~~*b)* Part B, containing the networks of existing systems~~.

Editorial Note: The two regulatory examples below correspond to two views of § 3.1.1.4 – Generalized A, B, C, D parameters of CPM Report:

{MOD

2.3 *Allotment:* For the purpose of this Appendix, an allotment comprises:

– a nominal orbital position;

– a bandwidth of 800 MHz (uplink and downlink) in the frequency bands listed in Article 3 of this Appendix;

– a service area for national coverage;

~~– generalized parameters as defined in Annex 1 to this Appendix;~~

– a predetermined arc (PDA).}

{NOC

2.3}

Editorial Note: The regulatory example below corresponds to Options 1, 5 and 6 of § 6/1.10/3.1.2.6 – Existing systems of CPM Report:

{MOD

2.4 *Existing systems:* Those satellite systems, in the frequency bands covered by this Appendix, which are identified in Resolution **[XXX] (WRC-07)**.~~:~~

~~*a)* which are recorded in the Master International Frequency Register (MIFR); *or*~~

~~*b)* for which the coordination procedure has been initiated; *or*~~

~~*c)* for which the information relating to advance publication was received by the Radiocommunication Bureau before 8 August 1985,~~

~~and which in all cases are listed in Part B of the Plan.~~}

Editorial Note: The regulatory example below corresponds to Options 2, 3 and 4 of § 6/1.10/3.1.2.6 – Existing systems of CPM Report:

{SUP

2.4}

Editorial Note: The regulatory example below corresponds to Options 1 ,2, 3 and 4 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{SUP

2.5 to 2.6}

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{MOD

2.5 *Subregional systems:* For the purpose of the application of the provisions of this Appendix, a subregional system is a satellite system created by agreement among ~~neighbouring~~ countries Member States of the ITU or their authorized telecommunications operating agencies on the basis of their national allotments and intended to provide domestic or subregional services within the geographical areas of the countries concerned. When a service area of a subregional system includes partially or wholly the territories of other administrations (other than the notifying one) the notifying administration shall seek to obtain the clear agreement of that administration.

MOD

2.6 *Additional use:* For the application of the provisions of this Appendix, additional uses shall be those of an administration~~:~~

~~*a)*~~ which has a requirement of the satellite system whose characteristics differ from those used in the preparation ~~of Part A~~ of the Plan[; any such requirement shall be limited to the national ~~coverage~~service area, taking into account technical constraints, of the administration concerned, unless otherwise agreed]. ~~Additionally, such requirement can be met only if the allotment of the interested administration, or part of this allotment, has been converted into an assignment, or if the requirement cannot be met by the conversion of the allotment into an assignment;~~

~~*b)* which requires the use of all or part of its national allotment that has been suspended in accordance with § 6.54 of Article 6;~~}

Editorial Note: In MOD 2.6 above, it was questioned whether the sentence in square brackets needed to be retained or not.

ADD

2.7 *List of assignments (hereafter called in short the List)*: The List of assignments associated with the Plan, containing assignments resulting from the successful application of the provisions of Article 6 of Appendix **30B**.

Editorial Note: The regulatory example below corresponds to Option 1 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{ADD

2.8 *Predetermined arc (PDA)*: The predetermined arc (PDA) of an allotment is a segment of the geostationary-satellite orbit (GSO) about the nominal orbital position of the allotment intended to provide flexibility in the Plan. The PDA of an allotment is the fixed portion of the GSO defined by the overlap of a segment of **[**±10°**]** about the nominal orbital position established at the Conference and the corresponding service arc unless a submission for the conversion of the allotment or part[ADD 2.8A] of the allotment into an assignment has been received by the Bureau independent of any receivability analysis. When the Appendix **4** information for the conversion of an allotment or part[ADD 2.8A] of an allotment into an assignment according to § 6.1 has been received by the Bureau, the PDA will be considered as being zero in the whole 800 MHz bandwidth of the allotment. The PDA concept can be applied for all procedures of Articles 6 and 7.}

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{ADD

2.8 *Predetermined arc (PDA)*: The predetermined arc (PDA) of an allotment is a segment of the geostationary-satellite orbit (GSO) about the nominal orbital position of the allotment intended to provide flexibility in the Plan. The PDA of an allotment is the fixed portion of the GSO defined by the overlap of a segment of **[**±10°**]** about the nominal orbital position established at the Conference and the corresponding service arc unless a submission for the conversion of the allotment or part[ADD 2.8A] of the allotment into an assignment has been received by the Bureau independent of any receivability analysis. When the Appendix **4** information for the conversion of an allotment or part[ADD 2.8A] of an allotment into an assignment according to § 6.1 has been received by the Bureau, the PDA will be considered as being zero in the whole 800 MHz bandwidth of the allotment. The PDA concept may be applied only:

– to provide an allotment to a new Member State of the ITU;

– in the process of conversion of an allotment into an assignment;

– to accommodate a subregional system;}

Editorial Note: For the square brackets around ±10°, see § 6/1.10/3.1.2.4.1 – PDA at pre-design stage.

NOC

ARTICLE 3

NOC

Frequency bands

ADD 2.8A For the purpose of this Appendix, part of an allotment shall comprise either 300 MHz in the 6/4 GHz or 500 MHz in the 13/10-11 GHz part of the allotment in both directions.

Editorial Note: See Article 6.

NOC

ARTICLE 4

NOC

Execution of the provisions and associated Plan

SUP

ARTICLE 5 (WRC-03)

The Plan and the associated List of assignments

MOD

ARTICLE 6 (WRC-03)

MOD

Procedures for implementation of the Plan and regulation of the fixed-satellite service in the planned bands MOD 1 (WRC-03)

Editorial Note: The regulatory example below corresponds to Option 2 of § 6/1.10/3.1.2.2 – New ITU Member States of CPM Report:

{ADD

6.0 Submissions received under this Article shall be treated in order of receipt by the Bureau. Submissions under Article 7 from new ITU Member States shall be treated by the Bureau ahead of any other submissions received under this Article except submissions which were under examination by the Bureau at the time of receiving the request from the new Member State.}

MOD 1 If the payments are not received in accordance with the provisions of Council Decision 482, as amended, on the implementation of cost recovery for satellite network filings, the Bureau shall cancel the publication specified in § ~~6.26, 6.33 and~~ 6.49 and the corresponding entries in the List under § ~~6.26, 6.34,~~ 6.50, ~~as appropriate,~~ or cancel entries in the List under § 6.23*bis* or 6.44, as appropriate, after informing the administration concerned. The Bureau shall inform all administrations of such action and that the network specified in the publication in question no longer has to be taken into consideration by the Bureau and other administrations. The Bureau shall send a reminder to the notifying administration not later than two months prior to the deadline for the payment specified in the above-mentioned Decision 482, unless the payment has already been received (see also Resolution **87 (WRC-03)**). (WRC-0~~3~~7)

Editorial Note: See the issue on cost recovery discussed under Agenda item 1.12.

NOC

Section I – Procedure for conversion of an allotment into an assignment

MOD

6.1 When an administration intends to convert an allotment into an assignment employing all or part of its allotment in ~~Part A of~~ the Plan, it shall, not earlier than eight years and not later than two years before the planned date of bringing the ~~network~~ assignment into use, send to the Bureau the information specified in Appendix **4**. Upon receipt of this information, the Bureau shall associate a PDA of zero degree with any part of the concerned allotment. ~~If the assignment is not brought into use by that date, the assignments recorded in the Appendix **30B** List shall be transferred to allotment(s) in Part A of the Appendix **30B** Plan with the predetermined arc (PDA) defined for a system in the pre-design stage in accordance with § 5.3 of Article 5 of Appendix 30B, without any changes to other technical parameters of allotments, of existing systems or of assignments recorded in the List.~~ (WRC-0~~3~~7)

ADD

6.1*bis* If the information received by the Bureau under § 6.1 is found to be incomplete, the Bureau shall immediately seek from the administration concerned any clarification required and information not provided.

ADD

6.1*ter* If the assignment is not brought into use within the eight years following the receipt by the Bureau of the relevant complete information under § 6.1 or § 6.1*bis* or by request of the notifying administration as appropriate, the Bureau shall:

a) cancel the related special sections and/or circular telegrams, as appropriate, and delete the assignment recorded in the Appendix **30B** List; *and*

b) reinstate the allotment in the Appendix **30B** Plan with the predetermined arc (PDA) defined in § 2.8 of Article 2 of Appendix **30B**.

Editorial Note: The regulatory example below corresponds to Option 1 of § 6/1.10/3.1.2.3.6 – Reinstatement of allotments in the Plan of CPM Report:

{The parameters of the reinstated allotments shall be those of the assignments deleted from the List, including the nominal orbital position, without any changes to technical parameters of other allotments or of assignments recorded in the List. The Bureau shall inform the notifying administration, three months in advance of the end of the eight-year period, of the actions it intends to take (see also 6.23*ter*).}

Editorial Note: Clarification will be needed on when the Bureau should effectively suppress the assignment from the List and update the reference situation with regards to the submission that is under treatment at the date of the suppression.

SUP

6.2 to 6.3

NOC

6.4

Editorial Note: The regulatory example below corresponds to one view of § 6/1.10/3.1.2.3.3 – Splitting allotments or assignments into multiple orbital locations of CPM Report:

{ADD

6.4*bis* A notice shall be returned to the notifying administration whenever the allotment has already been converted partially into an assignment located at an orbital position different to the proposed orbital position.}

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{ADD

6.4*ter* A notice shall be returned to the notifying administration when the service area of national allotment has already been included into a subregional system service area.}

SUP

6.5 to 6.11

SUP

Section IA – Procedure for conversion of an allotment into an assignment that is not in conformity with Part A of the Plan or that does not comply with Annex 3B

Editorial Note: The two regulatory examples below correspond to two views of § 6/1.10/3.1.2.3.3 – Splitting allotments or assignments into multiple orbital locations of CPM Report:

{MOD

6.12 Upon receipt of a complete (Appendix **4**) notice relating to the proposed assignment, ~~The~~ the Bureau shall examine it, as well as the remaining part of the allotment, if any, situated at the proposed orbital position:~~use this Section to determine if the proposed assignment affects:~~

~~*a)* the allotments in the Plan;~~

~~*b)* the assignments which appear in the List;~~

~~*c)* the assignments with respect to which the Bureau has previously received information in accordance with this Article.~~}

{MOD

6.12 Upon receipt of a complete (Appendix **4**) notice relating to the proposed assignment, ~~The~~ the Bureau shall examine it:~~use this Section to determine if the proposed assignment affects:~~

~~*a)* the allotments in the Plan;~~

~~*b)* the assignments which appear in the List;~~

~~*c)* the assignments with respect to which the Bureau has previously received information in accordance with this Article.~~}

ADD

6.12*bis* *a)* with respect to its conformity with the Table of Frequency Allocations and the other provisions[ADD6.12A] of these Regulations, except those provisions relating to conformity with the fixed-satellite service Plan;

ADD

6.12*ter* *b)* with respect to compatibility with the allotments in the Plan and the assignments which appear in the List using the limits defined in Annex 4.

Editorial Note: See § 6/1.10/3.1.2.3.8 – Pfd examination at the stage of application of Article 6.

ADD 6.12A The “other provisions” shall be identified and included in the Rules of Procedure.

MOD

6.13 If the examination with respect to § 6.12*bis* and/or 6.12*ter* leads to an unfavourable finding, ~~If the proposed assignment is not in conformity with Annex 3A,~~ the Bureau shall send the results of its examination ~~return the notice~~ to the notifying administration. That administration may within a period of 30 days after the Bureau sent the results of the first examination of the assignment in question: ~~indicating that it may take the following action:~~

a) modify the characteristics of its proposed assignment ~~in order to ensure its compatibility~~to resolve the unfavourable finding (including the selection of an alternative orbital position{ADD 6.13A}, preferably within its PDA); *or*

b) seek the agreement of the affected administrations using, *inter alia*, the techniques described in Annex 6~~select an alternative orbital position, preferably within its PDA~~; *or*

c) request the assistance of the Bureau in either course of action~~.~~,

and send the changes and/or agreements to the Bureau within that 30-day period.

SUP

6.14

NOC

6.15

MOD

6.16 If it is not possible to solve the problem mentioned in § 6.13 after having considered the possibility of finding an alternative orbital position, the concept of PDA (see Annex 5) ~~shall~~ may be used by the notifying administration or by the Bureau, if its assistance is requested.

ADD

6.16*bis* Following the application of § 6.13, the Bureau shall apply again the provisions of § 6.12 to 6.12*ter*.

SUP

6.17 to 6.22

Editorial Note: The regulatory example below corresponds to one view of § 6/1.10/3.1.2.3.3 – Splitting allotments or assignments into multiple orbital locations of CPM Report:

{ADD 6.13A Unless part of the allotment has already been converted into an assignment.**}**

MOD

6.23 ~~When no agreement is reached under § 6.20~~If the second examination with respect to § 6.12*bis* and/or 6.12*ter* leads to an unfavourable finding, the notice shall be returned to the notifying administration with an indication that subsequent resubmission will be considered with a new date of receipt.

Editorial Note: The regulatory examples below correspond to two views of § 6/1.10/3.1.2.3.3 – Splitting allotments or assignments into multiple orbital locations of CPM Report:

{ADD

6.23*bis* If the first examination under § 6.12 to 6.12*ter* or the second examination under § 6.16*bis*, as appropriate, leads to a favourable finding, the Bureau shall enter the proposed assignment into the List and publish the characteristics of the assignment and the result of its examination in a Special Section of the BR IFIC. The part of the allotment that has not been converted, if any, shall be located at the same orbital position as the proposed assignment. The administration may then notify the assignment in accordance with Article 8.}

{ADD

6.23*bis* If the first examination under § 6.12 to 6.12*ter* or the second examination under § 6.16*bis*, as appropriate, leads to a favourable finding, the Bureau shall enter the proposed assignment into the List and publish the characteristics of the assignment and the result of its examination in a Special Section of the BR IFIC. The administration may then notify the assignment in accordance with Article 8.}

ADD

6.23*ter* Upon a request of the notifying administration to suppress assignments stemming from the conversion of an allotment or following the suspension for two years (see § 8.17) of the use of assignments stemming from the conversion of an allotment, the Bureau shall, as soon as any network has been processed under this Article:

a) cancel the related special sections and delete the assignments recorded in the Appendix **30B** List; *and*

b) reinstate the allotment in the Appendix **30B** Plan with the predetermined arc (PDA) defined in § 2.8 of Article 2 of Appendix **30B**.

Editorial Note: The regulatory example below corresponds to Option 1 of § 6/1.10/3.1.2.3.6 – Reinstatement of allotments in the Plan of CPM Report:

{The parameters of the reinstated allotment shall be those of the assignments deleted from the List, including the nominal orbital position, without any changes to technical parameters of other allotments or of assignments recorded in the List. The Bureau shall inform the notifying administration, three months in advance of the end of the eight-year period, of the actions it intends to take.}

Editorial Note: The regulatory example below corresponds to a variant of Option 1 of § 6/1.10/3.1.2.3.6 – Reinstatement of allotments in the Plan of CPM Report:

{The parameters of the reinstated allotment shall be those of the original national allotment of this administration with all the test points located inside the national territory of the responsible administration, provided that this allotment is compatible with all allotments in the Plan and assignments in the List. Otherwise, they shall be those of the assignment deleted from the List, including the nominal orbital position, without any changes to other technical parameters of allotments in the Plan or of assignments recorded in the List.

The Bureau shall inform the notifying administration, three months in advance of the actions it intends to take.}

SUP

Section IB – Procedure for recording in the List of the existing systems contained in Part B of the Plan

Editorial Note: The regulatory example below corresponds to Options 2, 3 and 4 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{MOD

Section II – Procedure for the introduction of an assignment not stemming from the conversion of an allotment ~~subregional system~~

MOD

6.38 When ~~a group of~~an administration~~s~~, or one[ADD 6.38A] acting on behalf of a group of named administrations intends to bring into use ~~a subregional system~~an assignment to a space station not stemming from the conversion of an allotment, it shall ~~select one or more orbital positions for the system, preferably from the national allotments concerned, and send details of the assignment of the proposed network to the Bureau~~, not earlier than eight years and not later than two years before the planned date of bringing the assignment into use, send to the Bureau the information specified in Appendix **4**. ~~For this purpose, the administrations shall designate one among them to act on their behalf in the application of the provisions of this Appendix. The selected administration shall be known as the notifying administration. If the assignment is not brought into use by the planned date, the Bureau shall:~~

~~*a)* cancel the related special sections and/or circular telegrams, as appropriate, and the assignments recorded in the Appendix **30B** List;~~

ADD 6.38A Whenever, under this provision, an administration acts on behalf of a group of named administrations, all members of that group retain the right to respond in respect of their own networks or systems.

~~*b)* reactivate any relevant suspended allotments; *and*~~

~~*c)* update the reference situation of all allotments, existing systems and assignments recorded in the List, without any changes to their technical parameters.~~ (WRC-0~~3~~7)}

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{NOC

Section II – Procedure for the introduction of a subregional system

MOD

6.38 When an administration,ADD 6.38A acting on behalf of a group of named ~~When a group of~~ administrations intends to bring into use a subregional system, it shall ~~select one or more orbital positions for the system, preferably from the national allotments concerned, and send details of the assignment of the proposed network to the Bureau~~, not earlier than eight years and not later than two years before the planned date of bringing the assignment into use, send to the Bureau the information specified in Appendix **4**. ~~For this purpose, the administrations shall designate one among them to act on their behalf in the application of the provisions of this Appendix. The selected administration shall be known as the notifying administration. If the assignment is not brought into use by the planned date, the Bureau shall:~~

~~*a)* cancel the related special sections and/or circular telegrams, as appropriate, and the assignments recorded in the Appendix **30B** List;~~

~~*b)* reactivate any relevant suspended allotments; *and*~~

~~*c)* update the reference situation of all allotments, existing systems and assignments recorded in the List, without any changes to their technical parameters.~~ (WRC-03)}

ADD

6.38-1 If the information received by the Bureau under § 6.38 is found to be incomplete, the Bureau shall immediately seek from the administration concerned any clarification required and information not provided.

ADD

6.38-2 the notifying administration shall seek the explicit agreement of the administrations of other countries whose territories are included in the service area.

ADD

6.38*bis* If the assignment is not brought into use within the eight years following the receipt by the Bureau of the relevant complete information under this Article, the Bureau shall, as soon as any network has been processed under this Article:

a) cancel the related special sections and/or circular telegrams, as appropriate, and the assignment recorded in the Appendix **30B** List; *and*

b) update the reference situation of all allotments in the Plan and assignments recorded in the List, without any changes to their technical parameters.

The Bureau shall inform the notifying administration, three months in advance of the end of the eight-year period, of the action it intends to take.

Editorial Note: See views on suspension and options in § 6/1.10/3.1.2.1 – Procedures for the processing of submissions with regards to the following two regulatory examples:

{SUP

6.39 to 6.42}

{ADD

6.38*ter* An administration cannot be the notifying administration or participate in the group of named administrations referred to in § 6.38 for more than [X] system of the List

MOD

6.39 All or part of the national allotments used by the subregional system shall be suspended for the period of operation of this subregional system. Administrations being a part of a subregional system shall indicate their national allotments to be suspended because of the subregional system entering.~~unless it can be used in a way that does not affect allotments in the Plan or assignments made in accordance with the procedures associated with the Plan.~~

NOC

6.40 to 6.42.}

MOD

6.43 Upon receipt of a complete (Appendix **4**) notice relating to the proposed assignment, the Bureau shall examine it:~~use the method of Annex 4 to determine whether the proposed assignment affects:~~

~~*a)* the allotments in the Plan;~~

~~*b)* the assignments which appear in the List;~~

~~*c)* the assignments for which the Bureau has previously received complete information in accordance with this Article.~~ (WRC-0~~3~~7)

ADD

6.43-1 *a)* with respect to its conformity with the Table of Frequency Allocations and the other provisions[ADD 6.43-1] of these Regulations, except those provisions relating to conformity with the fixed-satellite service Plan;

ADD

6.43-2 *b)* with respect to compatibility with the allotments in the Plan and the assignments which appear in the List using the limits defined in Annex 4;

ADD

6.43-3 *c)* to determine whether the agreements under § 6.38-2 have been obtained.

NOC

6.43*bis*

MOD

6.44 If the examination with respect to § 6.43-1 to 6.43-3 leads to a favourable finding~~In the event of a favourable finding with regard to compatibility~~, the Bureau shall enter the proposed assignment in the List and publish the characteristics of the assignment and the result of its examination in a Special Section of the BR IFIC. The administration ~~shall~~ may then notify the assignment in accordance with Article 8.

MOD

6.45 ~~In the event of an unfavourable finding with regard to compatibility, the Bureau shall return the notice to the notifying administration, indicating that it may take the following action:~~

~~*a)* modify the characteristics of its proposed assignment in order to ensure its compatibility; *or*~~

~~*b)* select an alternative orbital position and proceed in accordance with § 6.38; *or*~~

~~*c)* request the assistance of the Bureau in either course of action.~~If the examination with respect to § 6.43-1, 6.43-2 and/or 6.43-3 leads to an unfavourable finding, the Bureau shall send the results of its examination to the notifying administration. That administration may within a period of 30 days after the Bureau sent the results of the first examination of the satellite networks in question:

a) modify the characteristics of its proposed assignment to resolve the unfavourable finding (including the selection of an alternative orbital position); *or*

ADD 6.43-1 The "other provisions" shall be identified and included in the Rules of Procedure.

b) seek the agreement of the affected administrations using, *inter alia*, the techniques described in Annex 6 and/or of the administrations whose agreement in accordance with § 6.43-3 is missing; *or*

c) request the assistance of the Bureau in either course of action,

and send the changes and/or agreements to the Bureau within that 30-day period.

SUP

6.46 to 6.47

MOD

6.48 ~~If it is not possible~~In order to solve the problem ~~of incompatibility~~ mentioned in § 6.45 ~~after having considered the possibility of finding an alternative orbital position~~, the concept of PDA (see Annex 5) may ~~shall~~ be used ~~(see § 5.3 of Article 5)~~ by the notifying administration or by the Bureau, if its assistance is requested.

ADD

6.48*bis* Following the application of § 6.45, the Bureau shall apply again the provisions of § 6.43 to 6.43-3.

Editorial Note: The two regulatory examples below correspond to the two view of § 6/1.10/3.1.2.3.9 – Comments on information published in the BR IFIC of CPM Report:

{MOD

6.49 ~~In the event of a successful application of § 6.48~~If the second examination with respect to § 6.43-1 to 6.43-3 leads to a favourable finding, the Bureau shall enter the proposed assignment into the List and publish the characteristics of the assignment and the result of its ~~calculations~~ examination ~~and the modified orbital locations~~ in a Special Section of the BR IFIC. The administration may then notify the assignment in accordance with Article 8.

SUP

6.50}

{MOD

6.49 ~~In the event of a successful application of § 6.48~~If the second examination with respect to § 6.43-1 to 6.43-3 leads to a favourable finding, the Bureau shall publish the characteristics of the assignment and the result of its ~~calculations~~ examination and the modified orbital locations in a Special Section of the BR IFIC. The result of the examination by the Bureau shall also be available to administrations on the ITU website.

MOD

6.50 If, within ~~forty-five~~[14-30] days from the date of the BR IFIC mentioned in § 6.49, the Bureau receives no comments, it shall be deemed that there are no objections to the proposed solution and the proposed assignment shall be recorded in the List. The administration ~~shall~~ may then notify the assignment in accordance with Article 8. Comments, if any, shall be limited to the case of an administration believing that the agreed protection criteria have not been met. If it receives such comments, the Bureau shall initiate the appropriate action to resolve the matter. (WRC-0~~3~~7) }

MOD

6.51 ~~In the event of an unsuccessful application of § 6.48, § 6.49 and § 6.50~~If the second examination with respect to § 6.43-1, 6.43-2 and/or 6.43-3 leads to an unfavourable finding, the Bureau shall return the notice to the notifying administration with an indication that subsequent resubmission will be considered with a new date of receipt.

Editorial Note: The regulatory example below corresponds to Options 1 ,2, 3 and 4 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{SUP

6.52 to 6.53}

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{MOD

6.52 If an administration withdraws from a subregional system, it shall inform the Bureau. ~~The Bureau shall take account of this withdrawal when applying the provisions relating to the compatibility of new assignments.~~ The territory of the administration that has withdrawn from the subregional system shall be excluded from the service area of this system.

MOD

6.53 If an administration which has withdrawn from a subregional system wishes to implement a national system, and is unable to satisfy the condition of compatibility in relation to the subregional system ~~§ 6.39~~ for the use of all or part of its allotment (as a result of § 6.41), it may proceed under the provisions of Section III of this Article. ~~relating to additional uses for the allotment or part of the allotment, as appropriate.~~}

MOD

6.54 ~~When a subregional system is terminated by the participating administrations, the notifying administration shall inform the Bureau as early as possible and the Bureau shall~~Upon a request of the notifying administration to suppress assignments entered into the List under the provisions of this section or following the suspension for two years (see § 8.17) of the use of such assignments, the Bureau shall, as soon as any network has been processed under this Article:

a) publish this information in a Special Section of its BR IFIC;

b) cancel the relevant Special Sections and the~~all frequency~~ assignments recorded in the Appendix **30B** List~~ relating to that system~~;

c) update the reference situation of all allotments in the Plan and assignments recorded in the List, without any changes to their technical parameters.~~modify Part A of the Plan to indicate that the corresponding national allotments are no longer suspended.~~

Editorial Note: The regulatory example below corresponds to Options 1, 2, 3 and 4 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{SUP

Section III – Supplementary provisions applicable to additional uses in the planned bands}

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{NOC

Section III – Supplementary provisions applicable to additional uses in the planned bands

SUP

6.55

MOD

6.56 An administration, or one acting on behalf of a group of administrations, may apply the procedure of this Section for an additional use as defined in Article 2, provided that the proposed assignments have a maximum period of validity of 15 years and will not, except if agreed to by the administrations affected, require any displacement of the orbital position of an allotment ~~in Part A~~ of the Plan or the orbital position of an assignment in the List, nor be incompatible with:

a) the allotments in the Plan;

b) the assignments in the List~~;~~.

~~*c)* the assignments for which the Bureau has previously received information in accordance with this Article.~~

NOC

6.56*bis* to 6.59

SUP

6.60

NOC

ARTICLE 7

NOC

Procedure for the addition of a new allotment to the Plan for a new Member State of the Union

MOD

7.1 The administration of a country which has joined the Union as a new Member State shall obtain a national allotment in ~~Part A of~~ the Plan by the following procedure.

NOC

7.2

Editorial Note: The regulatory example below corresponds to Option 2 of § 6/1.10/3.1.2.2 – New ITU Member States of CPM Report:

{MOD

7.3 Upon receipt of the complete information (mentioned in § 7.2 above), the Bureau shall ~~find an~~, according to § 6.0, identify and suggest appropriate orbital positions to the requesting administration, ~~if necessary using the PDA concept,~~ which may then select one of the proposed positions. In order to resolve possible incompatibilities, the concept of PDA (see Annex 5) may be used by the notifying administration or by the Bureau, if its assistance is requested. If the examination with respect to § 8.8 of Article 8 and compatibility with allotments and assignments of other administrations leads to a favourable finding, the Bureau ~~and~~ shall enter the national allotment of the new Member State of the Union in ~~Part A of~~ the Plan and publish the characteristics of the allotment concerned and the result of its examination in a Special Section of the BR IFIC.}

Editorial Note: The regulatory example below corresponds to Option 1 of § 6/1.10/3.1.2.2 – New ITU Member States of CPM Report:

{MOD

7.3 Upon receipt of the complete information (mentioned in § 7.2 above), the Bureau shall ~~find an~~ identify and suggest appropriate orbital positions to the requesting administration, ~~if necessary using the PDA concept,~~ which may then select one of the proposed positions. In order to resolve possible incompatibilities, the concept of PDA (see Annex 5) may be used by the notifying administration or by the Bureau, if its assistance is requested. If the examination with respect to § 8.8 of Article 8 and compatibility with allotments and assignments of other administrations leads to a favourable finding, the Bureau ~~and~~ shall enter the national allotment of the new Member State of the Union in ~~Part A of~~ the Plan and publish the characteristics of the allotment concerned and the result of its examination in a Special Section of the BR IFIC.}

SUP

7.4

NOC

ARTICLE 8 (WRC-03)

NOC

Procedure for notification and recording in the Master Register of assignments in the planned bands for the fixed-satellite service

Editorial Note: See the issue on cost recovery discussed under Agenda item 1.12 for the need or otherwise to add a footnote to the title.

NOC

8.1

Editorial Note: The regulatory example below corresponds to Options 2, 3 and 4 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{MOD

8.2 If the first notice referred to in § 8.1 has not been received by the Bureau within the eight-year period mentioned in § 6.1~~,~~ or 6.38 ~~or 6.57~~ of Article 6, as appropriate, the assignments in the List shall no longer be taken into account by the Bureau and administrations. The Bureau shall then act as if the assignment in the List has not been brought into use in conformity with § 6.1~~,~~ or 6.38 ~~or 6.57~~ of Article 6, as appropriate. The Bureau shall inform the notifying administration, three months in advance of the end of the eight-year period, of the actions it intends to take. (WRC-0~~3~~7)}

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{NOC

8.2}

NOC

8.3

SUP

8.4

MOD

8.5 Complete notices shall be marked by the Bureau with their date of receipt and shall be examined in the date order of their receipt. Following receipt of a complete notice the Bureau shall, within not more than two months, publish its contents, with any diagrams and maps and the date of receipt, in the BR IFIC, which shall constitute the acknowledgement to the notifying administration of receipt of its notice. When the Bureau is not in a position to comply with the time-limit referred to above, it shall periodically so inform the administrations, giving the reasons ~~therefor~~thereof. (WRC-0~~3~~7)

NOC

8.6-8.8

MOD

8.9 *b)* with respect to its conformity with the fixed-satellite service Plan and the associated provisions.**ADD** 8.9A (WRC-0~~3~~7)

NOC

8.10-8.12

Editorial Note: The regulatory example below corresponds to Options 2, 3 and 4 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{MOD

8.13 A notice of a change in the characteristics of an assignment already recorded, as specified in Appendix **4**, shall be examined by the Bureau under § 8.8, and 8.9 as appropriate. Any changes to the characteristics of an assignment, that has been notified and confirmed as having been brought into use, shall be brought into use within eight years from the date of the notification of the modification. Any changes to the characteristics of an assignment that has been notified but not yet brought into use shall be brought into use within the period provided for in § 6.1~~, 6.29,~~ or 6.38 ~~or 6.57~~ of Article 6, as appropriate. (WRC-0~~3~~7)}

Editorial Note: The regulatory example below corresponds to Option 1 of § 6/1.10/3.1.2.3.2 – Notification of assignments with characteristics different from those in the List of CPM Report:

{**ADD** 8.9A When an administration notifies any assignment with characteristics different from those entered in the List through successful application of Article 6 of Appendix **30B**, the Bureau will undertake calculation to determine if the proposed new characteristics increase the interference level caused to other allotments and assignments in the Plan and List. The increase of the interference will be checked by comparing the C/I ratio (power density) of these other allotments and assignments, which result from the use of the proposed new characteristics of the subject assignment on the one hand, and those obtained with the characteristics of the subject assignment in the List, on the other hand. This C/I calculation is performed under the same technical assumptions and conditions.**}**

Editorial Note: See § 6/1.10/3.1.2.3.2 – Notification of assignments with characteristics different from those in the List.

{**ADD** 8.9A When an administration notifies any assignment with characteristics different from those entered in the List through successful application of Article 6 of Appendix **30B**, the Bureau will undertake calculation to determine if the proposed new characteristics increase the interference level caused to or the protection claimed from other allotments and assignments in the Plan and List. The increase of the interference or of the protection due to characteristics different from those entered in the List will be checked by comparing the C/I ratio (power density) of these other allotments and assignments, which result from the use of the proposed new characteristics of the subject assignment on the one hand, and those obtained with the characteristics of the subject assignment in the List, on the other hand. This C/I calculation is performed under the same technical assumptions and conditions.**}**

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{MOD

8.13 A notice of a change in the characteristics of an assignment already recorded, as specified in Appendix **4**, shall be examined by the Bureau under § 8.8, and 8.9 as appropriate. Any changes to the characteristics of an assignment, that has been notified and confirmed as having been brought into use, shall be brought into use within eight years from the date of the notification of the modification. Any changes to the characteristics of an assignment that has been notified but not yet brought into use shall be brought into use within the period provided for in § 6.1, ~~6.29,~~ 6.38 or 6.57 of Article 6, as appropriate. (WRC-0~~3~~7) }

SUP

8.14

NOC

8.15-8.16

MOD

8.17 Where the use of a recorded assignment to a space station is suspended~~ for a period not exceeding eighteen months~~, the notifying administration shall, as soon as possible, inform the Bureau of the date on which such use was suspended and the date on which the assignment is to be brought back into regular use. If the assignment is not brought back into use within two years from the date of suspension, the Bureau shall cancel the assignment from the Master Register and apply the provision of § 6.23*ter* or § 6.54 as appropriate.~~This latter date shall not exceed two years from the date of suspension.~~ (WRC-0~~3~~7)

*Editorial Note: The regulatory example below corresponds to the third view of § 6/1.10/3.1.2.7 – Coordination between FSS earth stations (receiving and transmitting) on the one hand, and terrestrial stations, on the other hand, in the Appendix **30B** frequency bands of CPM Report:*

{NOC

8.18}

NOC

8.19

*Editorial Note: The regulatory example below corresponds to the second view of § 6/1.10/3.1.2.7 – Coordination between FSS earth stations (receiving and transmitting) on the one hand, and terrestrial stations, on the other hand, in the Appendix **30B** frequency bands of CPM Report:*

{ADD

ARTICLE 8*bis* (WRC-~~03~~07)

ADD

Coordination, notification and recording in the Master International Frequency Register of frequency assignments to terrestrial stations in the bands 4 500-4 800 MHz, 6 725-7 025 MHz, 12.75-13.25 GHz

ADD

8*bis*1 Administrations planning to implement assignments to aircraft stations in the bands 4 500-4 800 MHz, 6 725-7 025 MHz and 12.75-13.25 GHz shall effect coordination with each of administrations which territory is completely or partially in the coordination area of receiving land station which connected with planned aircraft station. The coordination area is determined by extension of the service area of land station, within which the aircraft station operates, for predetermined coordination distance of 500 km.

ADD

8*bis*2 If, as a result of the application of this Article, coordination with concerned administrations responsible for typical earth stations operating in AP30B Plan bands 4 500-4 800 MHz, 6 725-7 025 MHz and 12.75-13.25 GHz is completed, then an administration responsible for the aircraft station may notify this frequency assignments under Article 11 for recording in the Master Register. A remark shall be included indicating either that coordination with concerned administrations is completed.}

NOC

ARTICLE 9

NOC

General provisions

Editorial Note: The regulatory example below corresponds to Options 2, 3 and 4 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{MOD

9.1 ~~Part A of t~~The Plan is limited to national systems providing a domestic service. Administrations may, however, in accordance with the provisions of Section II of Article 6, provide multinational services.~~use all or part of their allotments to form a subregional system.~~}

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.1 – Procedures for the processing of submissions of CPM Report:

{MOD

9.1 ~~Part A of t~~The Plan is limited to national systems providing a domestic service. Administrations may, however, in accordance with the provisions of Sections II and III of Article 6, provide multinational services.~~use all or part of their allotments to form a subregional system.~~}

SUP

9.2

NOC

ARTICLE 10

NOC

Plan for the fixed-satellite service in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz[5]

MOD

A.1 COLUMN HEADINGS OF ~~PART A OF~~ THE PLAN

NOC Col. 1

NOC Col. 2

MOD Col. 3 *Service arc* (western and eastern limits in degrees and tenths of a degree)MOD [6]

NOC Col. 4

NOC Col. 5

NOC Col. 6

NOC Col. 7

NOC Col. 8

NOC Col. 9

MOD Col. 10 Maximum ~~E~~earth station e.i.r.p. density (dB(W/Hz))~~[7]~~

MOD Col. 11 Peak ~~S~~satellite e.i.r.p. density (dB(W/Hz))~~[7]~~

NOC Col. 12

MOD 6 The service arc indicated in column 3 of ~~Part A of~~ the Plan represents that segment of the GSO which is common to all individual service arcs of each test point for its minimum elevation angle as given in Annex 1, § 1.3 of this Appendix.

SUP 7

NOC

A.2 TEXT FOR SYMBOLS IN REMARKS COLUMN OF THE PLAN

SUP 1

SUP 2

SUP 3

SUP 4

NOC 5

NOC *Note by the Secretariat …*

NOC 4 500-7 025 MHz

NOC 10.70-13.25 GHz

SUP

B COLUMN HEADINGS OF PART B OF THE PLAN

NOC

ARTICLE 11

NOC

ANNEX 1 (WRC-03)

NOC

Parameters used in characterizing the fixed-satellite service Plan

Editorial Note: To be updated following discussions on the issue of new parameters for allotments

SUP

ANNEX 2 (WRC-03)

Basic data to be furnished in notices relating to stations in the fixed-satellite service entering the design stage using frequency bands of the Plan

SUP

ANNEX 3A

Criteria for determining when proposed assignments are considered as being in conformity with the Plan

SUP

ANNEX 3B

Macrosegmentation concept

NOC

ANNEX 4 (WRC-03)

NOC

Limits for determining whether an allotment or an assignment made in accordance with the provisions of Appendix 30B is considered to be affected

Editorial Note: To be updated following discussions on the issue of new protection criteria for AP30B.

NOC

APPENDIX 1 TO ANNEX 4

NOC

Method for determination of the single-entry and aggregate carrier-to-interference ratio averaged over the necessary bandwidth of the modulated carrier

Editorial Note: To be updated following discussions on the issue of new protection criteria for AP30B.

NOC

ANNEX 5 (WRC-03)

NOC

Application of the PDA (predetermined arc) concept

MOD

1 The following method will be used in the application of the PDA concept (see § 6.16, 6.48 and 7.3), which is based on the criteria set out in § 1.1 below.

MOD

1.1 For the purposes of this Annex, the allotment or assignment of an administration will be considered as being affected by another administration if~~, at its nominal orbital position within the predetermined arc,~~ the calculated single-entry *C*/*I* is less than or equal to ~~30 dB (WRC-03 decided that for the examination of submissions received as from 5 July 2003 the value~~ [27] dB ~~(instead of 30 dB) shall be applied)~~, or the calculated value, based on the Plan or the List, due to [any][that] other administration (whichever is [the lowest][lower]), at any test point within the service area of the interfered-with satellite network. The single-entry *C*/*I* is calculated by the method in Appendix 1 to Annex 4.

Even if the single-entry *C*/*I* is above ~~30 dB (WRC-03 decided that for the examination of submissions received as from 5 July 2003 the value~~ [27] dB ~~(instead of 30 dB) shall be applied)~~, or the calculated value, based on the Plan or the List, due to [any][that] other administration (whichever is [the lowest][lower]), an administration shall be considered as being affected if the overall aggregate *C*/*I*, calculated by the method in Appendix 1 to Annex 4, falls below ~~26~~ [23] dB MOD [9] ~~(WRC-03 decided that for the examination of submissions received as from 5 July 2003 the value 23 dB (instead of 26 dB) shall be applied)~~, or the calculated value based on the Plan and the List for the assignment (whichever is the lower).

MOD 9 For allotments with an aggregate *C*/*I* less than ~~26 dB (WRC-03 decided that for the examination of submissions received as from 5 July 2003 the value~~ 23 dB ~~(instead of 26 dB) shall be applied)~~, the calculated *C*/*I* based on the Plan and the List will be used. However, if through the use of the PDA Concept, this value is improved in the latter application of this procedure, the improved value will be used until it reaches ~~26 dB (WRC-03 decided that for the examination of submissions received as from 5 July 2003 the value~~ 23 dB ~~(instead of 26 dB) shall be applied)~~. (WRC-0~~3~~7)

An administration will not be considered to be affected if the nominal orbital position associated with its allotment in the Plan is moved within the corresponding PDA[ADD 1.1A] while keeping compatibility with the Plan and the List. (WRC-0~~3~~7)

Editorial Note: See § 6/1.10/3.1.1.2 – Protection criteria.

MOD

1.2 The PDA Concept shall be applied as follows~~in the following steps~~:

a) ~~the order of all satellites and also the position of satellites in the "design" or "operational" stages shall be fixed so as to minimize the impact on these systems. Next, t~~The nominal positions of ~~"pre-design" systems~~ allotments in the Plan ~~shall~~ may be adjusted so as to compensate for the degraded C/I. The adjustments of nominal positions shall be limited to the range of their respective predetermined arcs;

b) the ellipse of each allotment whose orbital position has been adjusted shall be recalculated based on the test points of these allotments.

~~*b)* if compatibility is not obtained through § 1.2 *a)*, the ordering of allotments of satellites in the "pre-design" stage shall be subject to change within their predetermined arcs, as defined in Article 5;~~

~~*c)* if the *C/I* objectives are not achieved, the affected administration may at this stage opt to select other measures than repositioning, as described in § 1.2 *d)* below;~~

~~*d)* if compatibility is not achieved under § 1.2 *b)*, and if the measures of § 1.2 *c)* are unsuccessful, the allotment(s)/assignment(s) subject to repositioning shall include the systems in the "design" stage, for their predetermined arc as defined in Article 5.~~

NOC

1.3

NOC

ANNEX 6 (WRC-03)

NOC

Technical means which may be used to avoid incompatibilities between systems in the fixed-satellite service at their implementation stage

Editorial Note: The utility of this Annex is to be discussed.

ADD 1.1A The allotment can be moved outside the PDA with the prior agreement of the responsible administration.

ADD

DRAFT RESOLUTION [XXX] (WRC-07)

Satellite systems in Part B of Appendix 30B

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that WARC-Orb-88 adopted a Plan for the fixed-satellite service in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz as contained in Appendix **30B**;

b) that, when the Plan was adopted, some satellite systems in the same frequency bands were under coordination or had been recorded in the Master International Frequency Register (MIFR) or had information relating to advance publication that was received by the Radiocommunication Bureau before 8 August 1985 and which in all cases were listed in Part B of the Plan at WARC-Orb 88;

c) that in the original provisions of Appendix **30B** (WARC-Orb 88), the satellite systems referred to in *considering b)* above were designated as "existing systems";

d) that satellite systems identified in *considering b)* have either been included into the List of Appendix **30B** or cancelled, and thus Part B of the Plan is empty;

e) that therefore WRC-07 suppressed Part B of the Plan in Appendix **30B**,

recognizing

a) that period of operation of satellite systems in Part B of the Plan expires after 16 March 2010;

b) that some administrations expressed their wish to continue operation of these systems after the deadline mentioned in *recognizing a)*;

c) that satellite systems referred to in *considering b)* are compatible with satellite networks in Appendix **30B**,

resolves

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.6 – Existing systems of CPM Report:

{1 that the period of validity of assignments to "existing system(s)" as referred to in *considering c)* shall be extended until 42 months from the closing of the Conference (WRC-07) at the request of the notifying administration;

2 that Administrations intending to further operate assignments to "existing system(s)" as referred to in *considering c)* shall so inform the Radiocommunication Bureau before 16 March 2010, indicating which assignments are concerned;

3 that, after the notifying administration has acted in accordance with *resolves* 2, assignments to "existing system(s)" as referred to in *considering c)* may continue to be operated in accordance with the period of validity including the extension provided in *resolves* 1 if appropriate;

4 that an administration wishing to further extend the notified period of validity of assignments to "existing system(s)" as referred to in *considering c)* shall inform the Bureau accordingly more than three years before the expiry of the period in question and if that assignment remains unchanged, the Bureau shall amend as requested the period of validity and publish that information in a special section of the Bureau's International Frequency Information Circular (BR IFIC),}

Editorial Note: The regulatory example below corresponds to Option 1 of § 6/1.10/3.1.2.6 – Existing systems of CPM Report:

{1 that administrations still having assignments of "existing systems" into operation and wishing to extend the period of validity of these assignment which are recorded in the List of assignments of Appendix **30B** beyond 16 March 2010 shall send to the Bureau the characteristics of the assignment together with the new period of validity;

2 that the characteristics of the assignment mentioned in *resolves* 1 shall be the same as the characteristics recorded in the List and the new period of validity shall not end after the period of validity of the corresponding assignment recorded in the Master Register,}

instructs the Radiocommunication Bureau

Editorial Note: The regulatory example below corresponds to Option 5 of § 6/1.10/3.1.2.6 – Existing systems of CPM Report:

{1 to cancel from the Master Register and the List assignments to "existing system(s)" as referred to in *considering c)* upon expiry of their period of validity or on 16 March 2010 if the notifying administration failed to communicate to the Radiocommunication Bureau the confirmation in accordance with *resolves* 2;

2 to take the appropriate actions in accordance with *resolves* 1 and 4.}

Editorial Note: The regulatory example below corresponds to Option 1 of § 6/1.10/3.1.2.6 – Existing systems of CPM Report:

{1 to take the appropriate actions in accordance with *resolves* 1 and 2.}

Editorial Note: The regulatory example below corresponds to the second view of § 6/1.10/3.1.2.7 – Coordination between FSS earth stations (receiving and transmitting) on the one hand, and terrestrial stations, on the other hand, in the Appendix ***30B*** *frequency bands of CPM Report:*

{

ARTICLE 9

Procedure for effecting coordination with or obtaining agreement of other administrations[1, 2, 3, 4, 5, 6, 7, 8] (WRC-03)

Section II – Procedure for effecting coordination[12, 13]

Sub-Section IIA – Requirement and request for coordination

ADD

9.19*bis* for any transmitting or receiving aircraft station in the frequency band allocated with primary status, with respect to typical earth stations included in the service area of a space station in fixed-satellite service in the frequency bands relevant to Appendix **30B** (see also Article 8*bis*, Appendix **30B**).

}

Annex 1.10-2

Example Regulatory Text for Changes to RR Appendix 30B Under the Non-Sequential Approach

This Annex contains an example of regulatory text that does not represent the views of all administrations and does not include all the options that are identified in the CPM text. See also § 6/1.10/4.2.

NOC

ARTICLE 1

NOC

Objective of the provisions and associated Plan

NOC

1.1

MOD

1.2 The procedures prescribed in this Appendix shall in no way prevent the implementation of assignments in conformity with ~~Part A~~ the national allotments of the Plan.

Reason: Consequential to elimination of Part B from the Plan.

NOC

ARTICLE 2

NOC

Definitions

NOC

2.1

MOD

2.2 *Plan:* The Plan for the fixed-satellite service in the frequency bands contained in this Appendix consisting of ~~two parts:~~ national allotments.

~~*a)* Part A, containing the national allotments;~~

~~*b)* Part B, containing the networks of existing systems.~~

Reasons: **“**Existing systems” are associated with FSS satellite networks that had already been submitted to the ITU BR when the Plan was developed. By now, the frequency assignments in these networks have either been brought into use and become assignments in the List of Appendix **30B** or have been cancelled. Therefore there is no need for keeping the concept of Part B of the Plan.

MOD

2.3 *Allotment:* For the purpose of this Appendix, an allotment comprises:

– a nominal orbital position;

– a bandwidth of 800 MHz (uplink and downlink) in the frequency bands listed in Article 3 of this Appendix;

– a service area for national coverage~~;~~

~~– generalized parameters as defined in Annex 1 to this Appendix;~~

~~– a predetermined arc (PDA)~~.

Reasons: The generalized parameters are not considered to be necessary since examination of the compatibility of any proposed assignment with allotments in the Plan or assignments in the List can be conducted without calculating such parameters. As discussed and justified in connection with Article 6 below, a non-sequential processing of submissions is being proposed here and such approach is not compatible with retention of the PDA concept.

Editorial Note: The example text below corresponds to Options 1, 5 and 6 of § 6/1.10/3.1.2.6 – “Existing systems”:

{MOD

2.4 *Existing systems:* Those satellite systems~~,~~ in the frequency bands covered by this Appendix, which are identified in Resolution **[XXX](WRC-07)**.~~:~~

~~*a)* which are recorded in the Master International Frequency Register (MIFR); *or*~~

~~*b)* for which the coordination procedure has been initiated; *or*~~

~~*c)* for which the information relating to advance publication was received by the Radiocommunication Bureau before 8 August 1985,~~

~~– and which in all cases are listed in Part B of the Plan.~~}

Editorial Note: The suppression of this provision corresponds to Options 2, 3 and 4 of § 6/1.10/3.1.2.6 – “Existing systems”.

{SUP

2.4}

SUP

2.5

Reasons: Subregional systems are now considered as “Additional Systems” together with conversions of allotments into assignments and modifications of assignments in the List under a single consolidated procedure in Article 6 of Appendix **30B**.

MOD

2.6 *Additional system ~~use~~:* For the application of the provisions of this Appendix, additional systems ~~uses~~ shall be ~~those of an administration:~~understood to be a system for which the assignments, notified by an administration, are not the result of conversion of an allotment into assignments. An additional system may also be submitted on behalf of a group of named administrations with one designated administration to act as the notifying administration in respect of the ITU.

~~*a)* which has a requirement whose characteristics differ from those used in the preparation of Part A of the Plan; any such requirement shall be limited to the national coverage, taking into account technical constraints, of the administration concerned, unless otherwise agreed. Additionally, such requirement can be met only if the allotment of the interested administration, or part of this allotment, has been converted into an assignment, or if the requirement cannot be met by the conversion of the allotment into an assignment;~~

~~*b)* which requires the use of all or part of its national allotment that has been suspended in accordance with § 6.54 of Article 6;~~

~~*c)* which intends to participate in a subregional system using the procedures of Section III of Article 6, instead of using the procedures of Section II thereof.~~

Reasons: Definition of the new category of “additional systems” covers both former “additional uses” and former “subregional systems”. The concepts of subregional systems and additional uses have been introduced in the Appendix **30B** Plan with different motivations. In particular, subregional systems intended to allow neighbouring countries to combine their allotments into a system with regional coverage. For that reason, the possibility of suspending allotments was associated with subregional systems. However, up to now the submissions for subregional systems have seldom if ever included requests for suspension or partial suspension of allotments and such submissions have been implemented in a way that does not affect allotments in the Plan or assignments in the List. Therefore, subregional systems have actually been implemented as “additional uses” in the sense that they will coexist with allotments and assignments as additional uses have. In view of the above, it is proposed to eliminate the category of subregional systems and to have a new and more simplified definition for “additional system”, capable of accommodating requirements currently being met by the two existing categories.

Editorial Note: The example text below corresponds to Options 1, 5 and 6 of § 6/1.10/3.1.2.6 – "Existing systems":

{ADD

2.7. *List of assignments (hereafter called in short the "List")*: The List associated with the Plan contains assignments resulting from the successful application of the provisions of Article 6 of Appendix **30B** or the application of Resolution **[XXX](WRC-07)**.

Reasons: Consequential to the revision of the provisions of Article 6 and the treatment of former Part B "existing systems" under Resolution **[XXX] (WRC-07)**.}

Editorial Note: The example text below corresponds to Options 2, 3 and 4 of § 6/1.10/3.1.2.6 – "Existing systems":

{ADD

2.7. *List of assignments (hereafter called in short the "List")*: The List associated with the Plan contains assignments resulting from the successful application of the provisions of Article 6 of Appendix **30B**.

Reasons: Consequential to the revision of the provisions of Article 6 and the treatment of former Part B "existing systems" under Resolution **[XXX] (WRC-07)**.}

NOC

ARTICLE 3

NOC

Frequency bands

Reasons: Article 3 does not need to be changed because the frequency bands subject to Appendix **30B** will remain the same.

NOC

ARTICLE 4

NOC

Execution of the provisions and associated Plan

Reasons: Article 4 should be retained as it is because it conveys the general idea of operation with the characteristics of the Plan (§ 4.1 of Article 4) and at the same time refers to the possible exceptions contemplated in Appendix **30B** itself or elsewhere in the RR.

SUP

ARTICLE 5 (WRC-03)

The Plan and the associated List of Assignments

Reasons: The predetermined arc (PDA) concept is not pertinent under the example offered for consideration in this Annex. Additionally, material relating to List of assignments has been transferred to Article 2 containing definitions.

Editorial Note: Although it has been proposed to suppress Article 5, for the sake of clarity, the Articles which follow have not been renumbered. Article 6 (Rev.WRC-03) would become Article 5 (WRC-07) and so on, if the Articles following the suppressed Article 5 were to be renumbered.

NOC

ARTICLE 6

SUP

Procedures for implementation of the Plan and regulation of the fixed-satellite service in the planned bands[1] (WRC-03)

Reasons: The new single procedure needs only a single heading. The new heading for a revised Section II of Article 6 (shown below) can be applied to all of Article 6.

SUP

Section I – Procedure for conversion of an allotment into an assignment

Reasons: Consequential to suppression of all sections of Article 6 except for Section II which is used as the basis for a new single consolidated regulatory procedure.

SUP

Section IA – Procedure for conversion of an allotment into an assignment that is not in conformity with Part A of the Plan or that does not comply with Annex 3B

Reasons: Consequential to suppression of all sections of Article 6 except for Section II, which is used as the basis for a new single consolidated regulatory procedure.

SUP

Section IB – Procedure for recording in the List of the existing systems contained in Part B of the Plan

Reasons: This section is now irrelevant. Satellite systems in Part B of the Plan have either been brought into use and have become assignments in the List of RR Appendix **30B** or have been cancelled and thus Part B of the Plan is empty. “Existing systems” in § 2.4 of Article 2 are now covered by Resolution **[XXX] (WRC-07)**.

MOD

~~Section II –~~ Procedure for the conversion of an allotment into an assignment, for the introduction of an ~~subregional~~ additional system or for the modification to an assignment in the List[MOD 1, ADD 6A]

Reasons: The new title of the new consolidated regulatory procedure is the title of a revised Article 6.

MOD

6.1~~6.38~~ When an ~~group of~~ administrations intends to ~~bring into use~~ convert an allotment into an assignment or when an administration, or one acting on behalf of a group of administrations[ADD 6.1A], intends to introduce an additional system or modify characteristics of assignments in the List for a system that has been brought into use,~~a subregional system~~ it shall ~~select one or more orbital~~

MOD 1 If the payments are not received in accordance with the provisions of Council Decision 482, as amended, on the implementation of cost recovery for satellite network filings, the Bureau shall cancel the publication specified in § ~~6.26, 6.33 and 6.49~~ 6.7 and the corresponding entries in the List under § 6.23 or 6.25~~6.26, 6.34, 6.50~~, as appropriate, ~~or cancel entries in the List under § 6.44, as appropriate,~~ after informing the administration concerned. The Bureau shall inform all administrations of such action and that the network specified in the publication in question no longer has to be taken into consideration by the Bureau and other administrations. The Bureau shall send a reminder to the notifying administration not later than two months prior to the deadline for the payment specified in the above-mentioned Decision 482, unless the payment has already been received (see also Resolution **87 (WRC-03)**). (WRC-~~03~~07)

Editorial Note: See the issue on cost recovery discussed under Agenda item 1.12.

ADD 6A The provisions of Resolution **49 (Rev.WRC-07)** apply.

ADD 6.1A Whenever, under § 2.6, an administration acts on behalf of a group of named administrations, all members of that group retain the right to respond in respect of their own networks or systems.

Reasons: Gives administrations participating in an “additional system” providing multi-national services, equal rights with respect to their own networks.

~~positions for the system, preferably from the national allotments concerned, and send details of the assignment of the proposed network to the Bureau~~, not earlier than eight years and not later than two years before the planned date of bringing the assignments or the modifications to the assignments in the List into use, send to the Bureau the information specified in Appendix **4**. ~~For this purpose, the administrations shall designate one among them to act on their behalf in the application of the provisions of this Appendix. The selected administration shall be known as the notifying administration. If the assignment is not brought into use by the planned date, the Bureau shall:~~.

~~*a)* cancel the related special sections and/or circular telegrams, as appropriate, and the assignments recorded in the Appendix **30B** List;~~

~~*b)* reactivate any relevant suspended allotments; *and*~~

~~*c)* update the reference situation of all allotments, existing systems and assignments recorded in the List, without any changes to their technical parameters. (WRC-03)~~

Reasons: The text clearly identifies the three scenarios under which it applies: a) conversion of an allotment with or without modifications to the allotment in the Plan; b) additional system; and c) modification of assignments in the List for systems that were brought into use. The qualification imbedded in the latter case c) "...that has been brought into use..." is considered very important in that it ensures that the eight year system implementation time limit is observed. Note that modifications to the initial RR Appendix **4** information as the result of coordination consultations, not to be confused with case c) above, is dealt elsewhere under this Article (please see provisions ADD 6.17 – ADD 6.21 on this issue.)

ADD

6.2 If the information received by the Bureau under § 6.1 is found to be incomplete, the Bureau shall immediately seek from the administration concerned any clarification required and information not provided.

Reasons: To provide the Bureau with the ability to request and to provide Administrations with the ability to provide, information missing from incomplete notices. This process serves the same purpose in ensuring an efficient process of examination of notices by the Bureau as that of § 11.27 of RR Article **11**.

SUP

6.39 to 6.42

MOD

6.3~~6.43~~ Upon receipt of a complete (Appendix **4**) notice relating to the proposed assignment, the Bureau shall examine the notice as to its conformity with the Table of Frequency Allocations and the other provisions [ADD 6.3A]of these Regulations, except those provisions relating to conformity with the fixed-satellite service Plan.~~use the method of Annex 4 to determine whether the proposed assignment affects:~~

~~*a)* the allotments in the Plan;~~

~~*b)* the assignments which appear in the List;~~

~~*c)* the assignments for which the Bureau has previously received complete information in accordance with this Article. (WRC-03)~~

Editorial Note: The regulatory example in ADD 6.4 below corresponds to Options 2 and 3 of § 6/1.10/3.1.2.5 – Service and coverage areas. Not adding this provision corresponds to Options 1, 4 and 5 of this section of the CPM report.

{ADD

6.4 The BR will then identify those administrations whose territory has been included in the service area of the proposed assignment(s) under § 6.1. The notifying administration shall seek the agreement of any administration whose territory is partially or wholly included in the intended service area of the proposed assignment(s).

Reasons: The intentional inclusion in the service area of a system of territories other than those of the notifying administration is understood to clearly signify the intent of the notifying administration to establish services in such territories. Consequently it is reasonable that the notifying administration seeks only the agreement of the administration whose territories are partially or wholly included in the system's intended service area and where such administrations have been identified by the Bureau as having their territories included in the service area. To facilitate consultations and to facilitate efficient processing by the Bureau, this agreement need only be submitted to the Bureau at the time the notifying administration submits its request to the Bureau for inclusion of its assignments in the List.}

ADD

6.5 When the examination of all or parts of the notice with respect to § 6.3 leads to an unfavourable finding, the relevant part of the notice shall be returned to the notifying administration with an indication that subsequent resubmission will be considered with a new date of receipt.

Reasons: Follows directly from the application of § 6.3. It is proposed that the consequence of an unfavourable finding be similar to that of Article **11** of the RR.

ADD 6.3A The "other provisions" shall be identified and included in the Rules of Procedure.

ADD

6.6 When the examination of all or parts of the notice with respect to § 6.3 leads to a favourable finding, the Bureau shall use the method of Annex 4, with respect to the relevant part of the notice to determine administrations whose:

– allotments in the Plan; or

– assignments which appear in the List; or

– assignments for which the Bureau has previously received complete information in accordance with this Article,

are considered as being affected.

Reasons: Follows directly from the application of MOD 6.3. Simplified as a result of equal treatment of allotments, assignments in the List and those systems for which the Bureau has previously received complete information.

ADD

6.7 The Bureau shall publish, in a Special Section of its International Frequency Information Circular (BR IFIC), the complete information received under § 6.1, together with the names of the administrations identified under § 6.4 and § 6.6 and the corresponding allotments in the Plan, assignments in the List, assignments for which the Bureau has previously received complete information in accordance with this Article.

Reasons: The Bureau maintains transparency in the process of its examinations by publishing the results of its examination for all ITU members to view and to verify. This is a necessary provision of information that would be normally expected by any affected administration.

Editorial Note: The regulatory example in ADD 6.8 below corresponds to Options 2 and 3 of § 6/1.10/3.1.2.5 – Service and coverage areas.

{ADD

6.8 The Bureau shall immediately send the results of its examination to the administration proposing the assignment, drawing attention to the requirement to seek and obtain the agreement of those administrations whose national territory is included in the service area of the system, or whose allotments are considered to be affected.

Reasons: There is a requirement to highlight two cases of identified administrations. Firstly, the case of administrations whose territories have been included in the service area of a system and secondly those whose allotments in the Plan or assignments resulting from the conversion of allotments are considered affected, on the basis of Annex 4 of RR Appendix **30B** criteria. Clearly, in these two cases it is incumbent upon the notifying administration to initiate and conclude the bilateral consultations in seeking the agreement of the affected administration(s) and not the responsibility of the affected administration(s) to respond within set timeframes in order to claim protection. Consequently, a provision such as ADD 6.8 greatly clarifies for the notifying administration the requirements to obtain these agreements by the time it submits to the Bureau its request for inclusion of its assignments in the List.}

Editorial Note: The regulatory example in ADD 6.8 below corresponds to Options 1, 4 and 5 of § 6/1.10/3.1.2.5 – Service and coverage areas.

{ADD

6.8 The Bureau shall immediately send the results of its examination to the administration proposing the assignment, drawing attention to the requirement to seek and obtain the agreement of those administrations whose allotments are considered to be affected.

Reasons: Even in the absence of an agreement from Administration A because of inclusion of its territory in the service area, agreement of Administration A will still be required if any of its allotments or assignments is affected by the submission. Moreover, terrestrial systems in the territory of Administration A are protected by the need to comply with the power flux density limits in Article **21** of the RR. Optionally, even if agreement with any administration being included in the service area is implicitly assumed, provisions allowing administrations at any time during the coordination period or after the network has been entered into the List, to remove its own territory from the service area of the network could be included. Words along the lines of RR **23.13C** could be included in RR Appendix **30B** to this effect.}

ADD

6.9 The Bureau shall also send a telegram/fax to the administrations listed in the Special Section of its BR IFIC drawing their attention to the information it contains and shall send them the results of its examination.

Reasons: Follows directly from ADD 6.7. This communication is a necessary provision of information that would be normally expected by any affected administration.

ADD

6.10 Comments from affected administrations on the information published pursuant to § 6.7 shall be sent to the administration proposing the assignment with a copy to the Bureau within a period of four (4) months following the date of its publication in the BR IFIC.

Reasons: The identified (affected) administration fulfils its obligation to reply to the administration proposing the assignment within a four (4) month regulatory timeframe while Bureau is kept apprised of consultations in the event that their assistance is requested by one of the parties.

ADD

6.11 Thirty days prior to the expiry of the same four (4) month period, the Bureau shall dispatch a reminder telegram or fax to an administration which has not made its comments under § 6.10, bringing the matter to its attention.

Reasons: Courtesy to administration and a safeguard in the event that the administration was not aware that they were affected for whatever reason.

ADD

6.12 An administration which considers that it should have been identified in the publication referred to under § 6.7 above shall, within four (4) months of the date of publication of its relevant BR IFIC, and identifying the affected allotment, assignment or proposed assignment, request the Bureau to include its name in the publication. The Bureau shall study this information on the basis of Annex 4 and shall inform both administrations of its conclusions. Should the Bureau agree to the administration's request, it shall publish an addendum to the publication under § 6.7.

Reasons: Provides administrations with recourse to demonstrate that it should have been included in the Bureau's original list of affected administrations and the opportunity to enter into a coordination exercise.

Editorial Note: The regulatory example in ADD 6.13 below corresponds to Options 2 and 3 of § 6/1.10/3.1.2.5 – Service and coverage areas.

{ADD

6.13 An administration, other than an administration identified under § 6.4 or whose allotment in the Plan or assignment resulting from the conversion of an allotment has been considered to be affected under § 6.6, that has not submitted its comments either to the administration seeking agreement or to the Bureau within a period of four (4) months following the date of the BR IFIC referred to in § 6.7 shall be deemed to have agreed to the proposed assignment.

Reasons: The onus is on the affected administration proposing or operating an additional system to act within the 4 month regulatory timeframe to ensure inclusion in the seeking agreement process.}

Editorial Note: The regulatory example in ADD 6.13 below corresponds to Options 1, 4 and 5 of § 6/1.10/3.1.2.5 – Service and coverage areas.

{ADD

6.13 An administration, other than an administration whose allotment in the Plan or assignment resulting from the conversion of an allotment has been considered to be affected under § 6.6, that has not submitted its comments either to the administration seeking agreement or to the Bureau within a period of four (4) months following the date of the BR IFIC referred to in § 6.7 shall be deemed to have agreed to the proposed assignment.

Reasons: The onus is on the affected administration proposing or operating an additional system to act within the 4 month regulatory timeframe to ensure inclusion in the seeking agreement process.}

ADD

6.14 After expiry of the deadline for comments in respect of the proposed assignment, the Bureau shall, according to its records, publish a Special Section indicating the list of administrations whose agreements are required for completion of the Article 6 procedure.

Reasons: Finalizes the determination of the list of affected administrations in the four (4) month regulatory time frame.

Editorial Note: The regulatory example below corresponds to Options 4 and 5 of § 6/1.10/3.1.2.5 – Service and coverage areas. Not adding this provision corresponds to Options 1, 2 and 3 of this section of the CPM Report:

{ADD

6.14*bis* An administration may at any time during or after the above mentioned four month period inform the Bureau about their objection to being included in the service area of the published network. The Bureau shall then delete the territory of the objecting administration from the service area of the network concerned without adversely affecting the rest of the service area and inform the responsible administration.}

ADD

6.15 If agreements have been reached with administrations identified in accordance with § 6.14, the administration proposing the new or modified assignment may request the Bureau to have the assignment entered into the List, indicating the final characteristics of the frequency assignment together with the names of the administrations with which agreement has been reached. For this purpose, it shall send to the Bureau the information specified in Appendix **4**. In submitting the notice, the administration may request the Bureau to examine the notice under §§ 6.18, 6.20, 6.21 and 6.22, (entry into the List) and § 8.8, 8.9 (notification).

ADD

6.16 If the information received by the Bureau under § 6.15 is found to be incomplete, the Bureau shall immediately seek from the administration concerned any clarification required and information not provided.

ADD

6.17 If, in seeking agreement, an administration modifies its initial notice, it shall again apply the provisions of § 6.1 and the consequent procedure with respect to any other administration whose services might be affected as a result of modifications to the initial notice. Examination under § 6.6 shall include consideration of allotments in the Plan, assignments in the List and assignments for which the Bureau has previously received complete information in accordance with this Article. For submissions for which the Bureau has received the complete information in the intervening period between the dates of receipt of the initial and modified notices, examination shall be made so as to ensure that the corresponding assignments are not affected or do not receive more interference from the modified notice.

ADD

6.18 Upon receipt of a complete (Appendix **4**) notice relating to the proposed assignment, the Bureau shall examine any modification to the initial notice as to its conformity with respect to the Table of Frequency Allocations and the other provisions[ADD 6.18A] of these Regulations, except those provisions relating to conformity with the fixed-satellite service Plan.

ADD

6.19 When the examination with respect to § 6.18 leads to an unfavourable finding, the notice shall be returned to the notifying administration with an indication that subsequent resubmission will be considered with a new date of receipt.

ADD

6.20 When the examination of all or parts of the modifications under § 6.18 leads to a favourable finding, the Bureau shall use the method of Annex 4 with respect to the relevant part of the notice to examine if the affected administrations and the corresponding

– allotments in the Plan;
– assignments which appear in the List;
– assignments for which the Bureau has previously received complete information in accordance with this Article;

indicated in the Special Section published under § 6.14 and whose agreement has not been reached under § 6.15 are still considered as being affected by the modifications to the notice.

ADD

6.21 The Bureau shall further examine each notice, or parts of a notice with a favourable finding under § 6.18 with respect to § 6.17 to identify administrations whose allotments in the Plan, assignments in the List and/or submissions for which the Bureau has previously received complete information in accordance with this Article are identified as affected as a result of the modifications to the initial notice.

ADD 6.18A The “other provisions” shall be identified and included in the Rules of Procedure.

Editorial Note: The regulatory example in ADD 6.22 to 6.25ter below corresponds to Options 2 and 3 of § 6/1.10/3.1.2.5 – Service and coverage areas:

{

ADD

6.22 The Bureau shall further examine each notice, or parts of a notice, with a favourable finding under § 6.18 with respect to the requirement for the notifying administration to seek the agreement of those administrations whose territories are partially or wholly included in the intended service area of the system.

SUP

6.43*bis*

ADD

6.23 In the event of a favourable finding under § 6.20, 6.21 and 6.22, the Bureau shall enter the proposed assignment in the List and publish in a Special Section of its BR IFIC the characteristics of the assignment received under § 6.15 together with the names of administrations with which the provisions of this Article have been successfully applied. The administration may then notify the assignment in accordance with Article 8.

ADD

6.24 When the examination under §§ 6.20, 6.21 and/or 6.22 leads to an unfavourable finding, the Bureau shall publish in a Special Section of its BR IFIC the information received under § 6.15 together with the names of any administrations with which the provisions of this Article have been successfully applied as well as the administrations with which they have not. Once the agreements being sought have been obtained, the notifying administration may again apply the procedures starting with § 6.15.

*Editorial Note: Provisions ADD 6.25 to 6.25ter describe under what conditions assignments can get into the List with outstanding coordination requirements. One view was that such provisions should be included in Appendix **30B** (See the two regulatory examples below, one with respect to additional systems and another one with respect to all assignments in the List). Another view was that such provisions should not be included. In the latter case, provisions ADD 6.25 to 6.25ter would not be inserted in Appendix **30B**.*

{ADD

6.25 After a notice is published under § 6.24, should the notifying administration resubmit the notice and insist upon its reconsideration, the Bureau, on the condition of a favourable finding with respect to § 6.22 and with respect to §§ 6.20 and 6.21 for allotments in the Plan or assignments resulting from the conversions of allotments, shall enter the assignments provisionally in the List with an indication of those administrations whose assignment(s) were the basis of the unfavourable finding[ADD 6.25A]. The entry shall be changed from provisional to definitive recording in the List only if the Bureau is informed that the new assignment has been in use, together with the assignment(s) which was the basis for the unfavourable finding, for at least four (4) months without any complaint of harmful interference.}

{ADD

6.25 After a notice is published under § 6.24, should the notifying administration resubmit the notice and insist upon its reconsideration, the Bureau, on the condition of a favourable finding with respect to § 6.22 and with respect to §§ 6.20 and 6.21 for allotments in the Plan, shall enter the assignments provisionally in the List with an indication of those administrations whose assignment(s) were the basis of the unfavourable finding[ADD 6.25A]. The entry shall be changed from provisional to definitive recording in the List only if the Bureau is informed that the new assignment has been in use, together with the assignment(s) which was the basis for the unfavourable finding, for at least four (4) months without any complaint of harmful interference.}

Editorial Note: In the case an assignment is entered into the List under § ADD 6.25, there is a possibility that the allotment or assignment which was the basis for the unfavourable finding causes interference into the assignment of the notifying administration. This footnote reflects the view that in the case a network is entered into the List under this provision, the notifying administration undertakes not to complain about any interference from this allotment (when it is converted into an assignment) or assignment. The other view was that there is no need for such an undertaking, in which case this footnote is not required.

{**ADD** 6.25A The entry shall be definitive in the case of a frequency assignment to a receiving station, under the condition that the notifying administration has undertaken that no complaint will be made in respect of any harmful interference which may be caused to that assignment by the assignment which was the basis for the unfavourable finding.}

ADD

6.25*bis* When an assignment is entered provisionally in the List under the provisions of § 6.25, the Bureau shall not update the reference situation for the Plan and the List until the recording is changed to definitive in accordance with § 6.25.

ADD

6.25*ter* Should harmful interference be caused by an assignment included in the List under § 6.25 to any assignment in the List which was the basis of the disagreement, the administration using the frequency assignment included in the List under § 6.25 shall, upon receipt of advice thereof, immediately eliminate this harmful interference.

}

Editorial Note: The regulatory example in ADD 6.22 to 6.25ter below corresponds to Options 1, 4 and 5 of § 6/1.10/3.1.2.5 – Service and coverage areas.

{

SUP

6.43*bis*

ADD

6.23 In the event of a favourable finding under § 6.20 and 6.21, the Bureau shall enter the proposed assignment in the List and publish in a Special Section of its BR IFIC the characteristics of the assignment received under § 6.15 together with the names of administrations with which the provisions of this Article have been successfully applied. The administration may then notify the assignment in accordance with Article 8.

ADD

6.24 When the examination under § 6.20 and/or 6.21 leads to an unfavourable finding, the Bureau shall publish in a Special Section of its BR IFIC the information received under § 6.15 together with the names of any administrations with which the provisions of this Article have been successfully applied as well as the administrations with which they have not. Once the agreements being sought have been obtained, the notifying administration may again apply the procedures starting with § 6.15.

*Editorial Note: Provisions ADD 6.25 to 6.25ter describe under what conditions assignments can get into the List with outstanding coordination requirements. One view was that such provisions should be included in Appendix **30B** (See the two regulatory examples below, one with respect to additional systems and another one with respect to all assignments in the List). Another view was that such provisions should not be included. In the latter case, provisions ADD 6.25 to 6.25ter would not be inserted in Appendix **30B**.*

{ADD

6.25 After a notice is published under § 6.24, should the notifying administration resubmit the notice and insist upon its reconsideration, the Bureau, on the condition of a favourable finding with respect to § 6.20 and 6.21 for allotments in the Plan or assignments resulting from the conversions of allotments, shall enter the assignments provisionally in the List with an indication of those administrations whose assignment(s) were the basis of the unfavourable finding[ADD 6.25A]. The entry shall be changed from provisional to definitive recording in the List only if the Bureau is informed that the new assignment has been in use, together with the assignment(s) which was the basis for the unfavourable finding, for at least four (4) months without any complaint of harmful interference.}

{ADD

6.25 After a notice is published under § 6.24, should the notifying administration resubmit the notice and insist upon its reconsideration, the Bureau, on the condition of a favourable finding with respect to §§ 6.20 and 6.21 for allotments in the Plan, shall enter the assignments provisionally in the List with an indication of those administrations whose assignment(s) were the basis of the unfavourable finding[ADD 6.25A]. The entry shall be changed from provisional to definitive recording in the List only if the Bureau is informed that the new assignment has been in use, together with the assignment(s) which was the basis for the unfavourable finding, for at least four (4) months without any complaint of harmful interference.}

ADD

6.25*bis* When an assignment is entered provisionally in the List under the provisions of § 6.25, the Bureau shall not update the reference situation for the Plan and the List until the recording is changed to definitive in accordance with § 6.25.

Editorial Note: In the case an assignment is entered into the List under § ADD 6.25, there is a possibility that the allotment or assignment which was the basis for the unfavourable finding causes interference into the assignment of the notifying administration. This footnote reflects the view that in the case a network is entered into the List under this provision, the notifying administration undertakes not to complain about any interference from this allotment (when it is converted into an assignment) or assignment. The other view was that there is no need for such an undertaking, in which case this footnote is not required.

{**ADD** 6.25A The entry shall be definitive in the case of a frequency assignment to a receiving station, under the condition that the notifying administration has undertaken that no complaint will be made in respect of any harmful interference which may be caused to that assignment by the assignment which was the basis for the unfavourable finding.}

ADD

6.25*ter* Should harmful interference be caused by an assignment included in the List under § 6.25 to any assignment in the List which was the basis of the disagreement, the administration using the frequency assignment included in the List under § 6.25 shall, upon receipt of advice thereof, immediately eliminate this harmful interference.

}

SUP

6.44 to 6.53

MOD

6.26~~6.54~~ When a ~~subregional system is terminated by the participating administrations,~~ frequency assignment included in the List is no longer required, the notifying administration shall immediately inform the Bureau~~ as early as possible and the Bureau shall:~~.

~~*a)* publish this information in a Special Section of its BR IFIC;~~

~~*b)* cancel all frequency assignments in the List relating to that system;~~

~~*c)* modify Part A of the Plan to indicate that the corresponding national allotments are no longer suspended.~~

ADD

6.27 The date of bringing into use may be extended by the notifying administration up to no more than eight years from the date of receipt by the Bureau of the complete Appendix **4** information under § 6.1.

ADD

6.28 When:

– an assignment is no longer required; or

– a frequency assignment recorded in the List and brought into use has been suspended for a period of two years ending after the expiry date specified in § 6.27; or

– a frequency assignment recorded in the List has not been brought into use within the eight year period following the receipt by the Bureau of the relevant complete information under § 6.1, with the exception of national systems submitted by new Member States where § 6.30 applies,

the Bureau shall:

a) publish in a Special Section of its BR IFIC the cancellation of the related Special Sections and of the assignments recorded in the Appendix **30B** List;

b) reinstate the allotment in the Appendix **30B** Plan, if appropriate;

c) update the reference situation for the allotments of the Plan and the assignments of the List;

d) if the cancelled assignment is the result of the conversion of an allotment with modifications, reinstate the allotment with the same orbital location and technical parameters of the cancelled assignment except for its service area that shall be the national territory of the administration whose allotment is being reinstated.

Editorial Note: One view was that explicit provisions should be included in Article 6 to delete networks that are not entered into the List by the expiry date of the submission. Another view was that this was covered in Article 8 (§ 8.2) and that it should not be addressed two places. Under this second view, ADD 6.28bis would not be included.

{ADD

6.28*bis* When a proposed new or modified frequency assignment has not fulfilled all the requirements for entering the List, in accordance with § 6.23 or § 6.25, by the expiry date specified in § 6.27 publish in a Special Section of its BR IFIC the cancellation of the related Special Sections.}

ADD

6.29 The procedure of this Article may be applied by the administration of a new ITU Member State in order to include new assignments in the List. Upon completion of the procedure, the next World Radiocommunication Conference may be requested to consider, among the assignments included in the List after the successful completion of this procedure, the inclusion in the Plan of a new allotment over the national territory of the new Member State.

Editorial Note: One view was that these provisions could also be applied by administration wishing to modify their allotment (e.g. move it to a different orbit location), but not convert it into an assignment. The other view was that such procedures are not required. In this latter case, ADD 6.29bis would not be included. See the two regulatory examples below:

{ADD

6.29*bis* When an administration has successfully applied this procedure and received all the agreements[ADD 6.29*bis*A] to include in the List assignments for an additional system over its national territory, at an orbital location different from that appearing in the Plan for its country, it may request the next World Radiocommunication Conference to consider the inclusion in the Plan of these assignments in replacement of its allotments in the Plan. If supported, the original allotment will then be entered into the List as an additional system.

ADD

6.30 If the assignments mentioned in § 6.29 and 6.29*bis* over the national territory of the administration are not brought into use within the eight years following the receipt by the Bureau of the relevant complete information under § 6.1, these assignments will be retained in the List until the end of the World Radiocommunication Conference immediately following the successful completion of the procedure referred to in § 6.29 and 6.29*bis*, and thereafter shall be converted to a national allotment for inclusion in the Plan and deletion of the associated assignments recorded in the List.}

{ADD

6.30 If the assignments mentioned in § 6.29 over the national territory of the administration are not brought into use within the eight years following the receipt by the Bureau of the relevant complete information under § 6.1, these assignments will be retained in the List until the end of the World Radiocommunication Conference immediately following the successful completion of the procedure referred to in § 6.29, and thereafter shall be converted to a national allotment for inclusion in the Plan and deletion of the associated assignments recorded in the List.}

Reasons: The Plan, being a Plan of national allotments, needs to be updated to account for and reflect geopolitical changes that take place over time. New Member States should be afforded entry(ies) in the Plan according to the provisions of this Appendix. It is therefore reasonable that following the successful completion of these procedures, even if the new Member State is unable to meet the eight year implementation time-frame, the results of the successful application of the procedures of this Appendix are captured and recorded in the Plan. This approach would allow for the equitable treatment of new and existing ITU Member States.

Editorial Note: One view was that if administrations are allowed to make modifications to their national allotments through application of these procedures, 6.25 should not apply. The other view was that these procedures could be applicable also for these cases. Following this latter view, this footnote would not be included.

{**ADD** 6.29*bis*A In such a case, § 6.25 does not apply.}

SUP

Section III – Supplementary provisions applicable to additional uses in the planned bands

Reasons: Treatment of additional uses is now covered under the category of additional systems in the new consolidated procedure of Article 6: “Procedure for the conversion of an allotment into an assignment, for the introduction of an additional system or for the modification to an assignment in the List”.

Editorial Note: The two regulatory examples below correspond to two views on whether or not a separate Article 7 is needed for new ITU Member States to obtain an allotment or whether the provisions of Article are sufficient for this purpose.

{SUP

ARTICLE 7

SUP

Procedure for the addition of a new allotment to the Plan for a new Member State of the Union

}

{NOC

ARTICLE 7

NOC

Procedure for the addition of a new allotment to the Plan for a new Member State of the Union

MOD

7.1 The administration of a country which has joined the Union as a new Member State shall obtain a national allotment in ~~Part A of~~ the Plan by applying the ~~following~~ procedure of this Article.

Reasons: Consequential to elimination of Part B and renaming Part A the “national allotments”.

ADD

7.1*bis* Upon the receipt of the complete information, BR should treat the complete information with a highest priority for a national allotment for the new Member State.

Reason: The objective of this AP30B is to guarantee in practice, for all countries, equitable access to the geostationary-satellite orbit in the frequency bands of the FSS Plan. Therefore, a new Member State of the Union also should have the right to have its national allotment.

MOD

7.2 The administration shall submit its request for an allotment to the Bureau, with the following information:

a) the geographical coordinates of not more than 10 test points for determining the minimal ellipse to cover its national territory;

b) the height above sea level of each of its test points and the rain ~~zone or zones~~rates (in mm/h);

c) any special requirement, other than a fixed orbital position, which is to be taken into account to the extent practicable.

MOD

7.3 Upon receipt of the complete information (mentioned in § 7.2 above), the Bureau shall find an appropriate orbital position~~, if necessary using the PDA concept,~~ and shall enter the national allotment of the new Member State of the Union in ~~Part A of~~ the Plan.

Reasons: Consequential to the adoption of a non-sequential processing of submissions and the elimination of the PDA concept and the elimination of Part B of the Plan.

NOC

7.4

}

NOC

ARTICLE 8 (WRC-03)

NOC

Procedure for notification and recording in the Master Register of assignments in the planned bands for the fixed-satellite service

MOD

8.1 Any assignment for which the relevant procedure of Article 6 has been successfully applied shall be notified to the Bureau using the relevant characteristics listed in Appendix **4**~~, not earlier than three years before the assignments are brought into use~~. (WRC-0~~3~~7)

MOD

8.2 If the first notice referred to in § 8.1 has not been received by the Bureau within the eight-year period mentioned in § 6.1~~, 6.38 or 6.57~~ of Article 6, ~~as appropriate,~~ the assignments in the List shall no longer be taken into account by the Bureau and administrations. The Bureau shall then act as if the assignment in the List has not been brought into use in conformity with § 6.1~~, 6.38 or 6.57~~ of Article 6~~, as appropriate~~. The Bureau shall inform the notifying administration, three months in advance of the end of the eight-year period, of the actions it intends to take. (WRC-0~~3~~7)

NOC

8.3

SUP

8.4

Reasons: Suppression is consequential of the elimination of the PDA concept.

MOD

8.5 Complete notices shall be marked by the Bureau with their date of receipt and shall be examined in the date order of their receipt. Following receipt of a complete notice the Bureau shall, within not more than two months, publish its contents, with any diagrams and maps and the date of receipt, in the BR IFIC, which shall constitute the acknowledgement to the notifying administration of receipt of its notice. When the Bureau is not in a position to comply with the time-limit referred to above, it shall periodically so inform the administrations, giving the reasons ~~therefor~~thereof. (WRC-0~~3~~7)

NOC

8.6 to 8.12

MOD

8.13 A notice of a change in the characteristics of an assignment already recorded, as specified in Appendix **4**, shall be examined by the Bureau under § 8.8, and 8.9 as appropriate. Any changes to the characteristics of an assignment, that has been notified and confirmed as having been brought into use, shall be brought into use within eight years from the date of the notification of the modification. Any changes to the characteristics of an assignment that has been notified but not yet brought into use shall be brought into use within the period provided for in § 6.1 and § 6.27~~, 6.29, 6.38 or 6.57~~ of Article 6~~, as appropriate~~. (WRC-0~~3~~7)

Reasons: Changes are consequential of those introduced in Article 6.

SUP

8.14

NOC

8.15 and 8.16

MOD

8.17 Where the use of a recorded assignment to a space station is suspended for a period not exceeding eighteen months, the notifying administration shall, as soon as possible, inform the Bureau of the date on which such use was suspended and the date on which the assignment is to be brought back into regular use. This latter date shall not exceed two years from the date of suspension. If the assignment is not brought back into use within two years from the date of suspension, the Bureau shall cancel the assignment from the Master Register and apply the provision of § 6.28. (WRC-0~~3~~7)

NOC

8.18

NOC

8.19

NOC

ARTICLE 9

NOC

General provisions

MOD

9.1 ~~Part A of t~~The Plan is limited to national systems providing a domestic service. Administrations may, however, in accordance with the provisions ~~of Section II~~ of Article 6, ~~use all or part of~~ convert their allotments or propose additional systems to provide multi-national services~~form a subregional system~~.

Reasons: Changes are consequential of the consolidated regulatory procedures introduced in Article 6.

SUP

9.2

Reasons: Existing systems are associated with FSS satellite networks that had already been submitted to the ITU BR when the Plan was developed. By now, the frequency assignments in these networks have either been brought into use and become assignments in the List or have been cancelled.

§ 9.2 strictly applied would require all these frequency assignments to cease operation (or operate under RR No. **4.4**) after 16 March 2010. Operation under RR No. **4.4** is not a realistic option, at least as RR Appendix **30B** frequencies are more widely used. Moreover, requiring that operational satellite networks with large number of users cease abruptly their operation is unreasonable.

By suppressing § 9.2, frequency assignments of existing systems that have been brought into use just remain in the List similarly to the way in which frequency assignments associated with subregional systems are currently treated. Draft Resolution **[XXX] (WRC-07)** is intended to cover "existing systems" as defined in § 2.4 of Article 2.

NOC

ARTICLE 10

MOD

Plan for the fixed-satellite service in the frequency bands 4 500-4 800 MHz, 6 725-7 025 MHz, 10.70-10.95 GHz, 11.20-11.45 GHz and 12.75-13.25 GHz~~[5]~~

Reasons: Consequential to proposed changes to interference criteria in § 1.4 of Section A of Annex 1.

MOD

A.1 COLUMN HEADINGS OF ~~PART A OF~~ THE PLAN

NOC Col. 1 *Beam identification* (Column 1 contains the symbol designating the country or the geographical area taken from Table B1 of the Preface to the International Frequency List)

NOC Col. 2 *Nominal orbital position*, in degrees and tenths of a degree

SUP Col. 3 *Service arc* (western and eastern limits in degrees and tenths of a degree)~~[6]~~

SUP Col. 4 *Predetermined arc* (western and eastern limits in degrees and tenths of a degree)

MOD Col. ~~5~~3 *Longitude of the boresight*, in degrees and tenths of a degree

MOD Col. ~~6~~4 *Latitude of the boresight*, in degrees and tenths of a degree

---

SUP 5

SUP 6

MOD Col. ~~7~~5 *Major axis of the elliptical cross-section half-power beam*, in degrees and tenths of a degree

MOD Col. ~~8~~6 *Minor axis of the elliptical cross-section half-power beam*, in degrees and tenths of a degree

MOD Col. ~~9~~7 *Orientation of the ellipse* determined as follows: in a plane normal to the beam axis, the direction of the major axis of the ellipse is defined by the angle measured anticlockwise from a line parallel to the equatorial plane to the major axis of the ellipse, to the nearest degree

MOD Col. ~~10~~8 Earth station e.i.r.p. density (dB(W/Hz))~~[7]~~

MOD Col. ~~11~~9 Satellite e.i.r.p. density (dB(W/Hz))~~[7]~~

MOD Col. ~~12~~10 *Remarks*

NOC

A.2 TEXT FOR SYMBOLS IN REMARKS COLUMN OF THE PLAN

SUP 1

SUP 2

SUP 3

SUP 4

NOC 5

NOC *Note by the Secretariat (applicable when an asterisk (*) appears in column 12):* concerned.

NOC 4 500-7 025 MHz

NOC 10.70-13.25 GHz

SUP

B COLUMN HEADINGS OF PART B OF THE PLAN

Reasons: Consequential to the elimination of Part B and the proposed treatment for "existing systems" (see Resolution **[XXX] (WRC-07)**).

SUP 7

NOC

ARTICLE 11

NOC

Period of validity of the provisions and associated Plan

NOC

11.1

Reasons: § 11.1 re-emphasizes the objectives of the Plan, as stated in Article 1, and should be retained.

MOD

11.2 These provisions and associated Plan shall, in any event, remain in force until their revision by a competent world ~~administrative~~ radiocommunication conference, convened in accordance with the relevant provisions of the Convention in force.

Reasons: Editorial change to take account of the fact that world administrative radiocommunication conferences are now referred to as world radiocommunication conferences.

NOC

ANNEX 1 (WRC-03)

NOC

Parameters used in characterizing the fixed-satellite service Plan

MOD

Section A – Technical data used in establishing the Allotment Plan and the associated provisions

Editorial Note: Two alternative sets of technical parameters in this section are provided. Each alternative has been drafted in order to be coherent throughout Annexes 1 and 4. See also § 6/1.10/3.1.1.1 and the table of summarized parameters in § 6/1.10/3.1.1.1.7.

Alternative 1

{

NOC

1 Basic technical characteristics

The allotments in the Plan are based on a reference satellite network with the following assumptions:

MOD

1.1 Type of modulation

The Plan is based upon supporting a maximum modulation index that results in a carrier-to-noise (*C*/*N*) threshold of 12 dB ~~independent of modulation characteristics and accessing techniques~~.

Reason: Modern satellite systems predominantly use digital modulation and thus have lower *C*/*N* thresholds. A 12 dB threshold should be adequate for most current and anticipated satellite applications.

MOD

1.2 Carrier-to-noise ratio

The carrier-to-noise ratio (*C*/*N*) is as follows:

a) the total link (*C*/*N*) under rain faded conditions should exceed a threshold of 12 dB; ~~the up-link *C* / *N* ratio is equal to 23 dB under rain fading conditions with a minimum earth station transmitter power density of – 60 dB(W/Hz) averaged over the necessary bandwidth of the modulated carrier;~~

~~*b)* the down-link *C* / *N* is equal to 17 dB under rain fading conditions;~~

~~*c)* the total *C* / *N* is equal to 16 dB under rain fading conditions;~~

~~d~~b) for the 6/4 GHz bands, the threshold is exceeded for 99.9% of the year; ~~above *C* / *N*s are exceeded for 99.95% of the year~~

~~(NOTE – The rain attenuation margin is limited to a maximum of 8 dB);~~

~~e~~c) for the 13/10-11 GHz bands, the threshold is exceeded for 99.8% of the year; ~~above *C* / *N*s are exceeded for 99.9% of the year~~

~~(NOTE – The rain attenuation margin is limited to a maximum of 8 dB);~~

~~f~~d) the gaseous atmospheric attenuation and rain attenuation models used are~~is~~ those~~at~~ described in Recommendations ITU-R P.676-6 and ITU-R P.618-8~~respectively.Report 564-3[*] (1986)~~.

Reasons:

a) Commercial satellite systems predominantly use "bent-pipe" (transparent) transponders and thus have a threshold *C*/*N* at the receiver earth station only;

b) A total link availability of 99.9% is consistent with separate uplink and downlink availabilities of 99.95% and 99.95%, respectively;

c) A total link availability of 99.8% is consistent with separate uplink and downlink availabilities of 99.9% and 99.9%, respectively;

d) The pertinent Recommendations that are in force are listed.

MOD

1.3 Earth station antenna elevation angle

The minimum elevation angle for each test point defining the service area is based on the following values of rain rate $R_{0.01}$ (exceeded for the worst 0.01% of the time) [‡‡]:

10° for ~~climatic zones A to G~~ $R_{0.01} \leq 30$ mm/h;

20° for ~~climatic zones H to L~~$30 < R_{0.01} \leq 60$ mm/h;

30° for ~~climatic zones M and N~~$60 < R_{0.01} \leq 95$ mm/h;

40° for ~~climatic zone P~~$R_{0.01} > 95$ mm/h.

Administrations may select lower elevation angles for their service areas. For countries at high latitudes or with dispersed territories, in the absence of such a request, if the above values for minimum elevation angle are unobtainable, then the highest elevation angle leading to a non-zero service arc applies. In mountainous areas, the elevation angles are specified by the administrations concerned.

Reasons: The latest in-force version of Recommendation ITU-R P.837(-4) uses rain rate, expressed in (mm/hr) exceeded for the worst 0.01% of the time as the basis for the determination of rain fade using Recommendation ITU-R P.618-8. The rain rate ranges corresponding to the "old" climatic zones in version 1 of Recommendation ITU-R P.837 have been used in place of the climatic zones listed.

~~[*] This Report is no longer in force.~~

[‡‡] The rain rate corresponds to the rain rate which is exceeded for the worst 0.01% of the time in an average year in accordance with *recommends* 2 of Recommendation ITU-R P.837-4.

MOD

1.4 Interference criteria

The Plan has been prepared with a view to assuring for each allotment an aggregate carrier-to-interference ratio under free-space conditions of ~~26~~22 dB or higher for the 13/10-11 GHz bands and 20 dB or higher for the 6/4 GHz bands. ~~WRC-03 decided to apply an aggregate carrier-to-interference ratio under free-space conditions of 23 dB for submissions received by the Bureau as from 5 July 2003.~~ (WRC-0~~3~~7)

NOC

1.5 Polarization

Polarization isolation between satellite networks was not used in the development of the Allotment Plan.

NOC

1.6 Earth station characteristics

MOD

1.6.1 The diameters of the earth station antennas are:

4.5~~7~~ m for the 6/4 GHz band;

2.4~~3~~ m for the 13/10-11 GHz band.

Reasons: Technical studies have indicated that these are the minimum antenna sizes that when used in association with: the revised *C*/*N* threshold (MOD 1.2), interference criteria (MOD 1.4), earth station receiving systems noise temperatures (MOD 1.6.2) and space station receiving system noise temperatures (MOD 1.7.3); that national allotments and assignments in the List are adequately protected (i.e., in accordance with the provisions of RR Appendix **30B (WRC-07)**).

MOD

1.6.2 The earth station receiving system noise temperature referred to the output of the receiving antenna is:

95~~140~~ K for the 4 GHz band;

125~~200~~ K for the 10-11 GHz band.

Reasons: These earth station noise temperatures are typical of those that can be achieved with modern technology.

NOC

1.6.3 The earth station antenna efficiency is 70%.

MOD

1.6.4 The applicable earth station antenna reference pattern ~~applicable to all Part A allotments~~ is shown in Table 1 below. If so desired by an administration, the improved side-lobe pattern shown in Table 2 below may be used. (WRC-0~~3~~7)

NOC

TABLE 1 (WRC-03)

$G_{max} = 10 \log (\eta(\pi D/\lambda)^2)$	
$G(\varphi) = G_{max} - 2.5 \times 10^{-3} \left(\frac{D}{\lambda}\varphi\right)^2$	for $0 < \varphi < \varphi_m$
$G(\varphi) = \min (G_1, 29 - 25 \log \varphi)$	for $\varphi_m \leq \varphi \leq 19.95°$
$G(\varphi) = \max (\min (-3.5, 32 - 25 \log \varphi), -10)$	for $\varphi > 19.95°$

where:

D : antenna diameter
λ : wavelength
} expressed in the same unit

φ : off-axis angle of the antenna (degrees)

G_1 : gain of the first side lobe $= -1 + 15 \log \frac{D}{\lambda}$

$$\varphi_m = \frac{20\lambda}{D} \sqrt{G_{max} - G_1} \quad \text{degrees}$$

η : antenna efficiency

MOD

1.6.5 In cases where the required aggregate C/I ratio ~~of 26 dB~~ specified in 1.4 of this Annex cannot be obtained ~~(WRC-03 decided that for the examination of submissions received as from 5 July 2003 the value 23 dB (instead of the of 26 dB) shall be applied)~~, it would be appropriate for the countries concerned to agree on the use of antennas with an improved sidelobe pattern or on other suitable means so as to obtain the above ratio (see Table 2 below). (WRC-0~~3~~7)

Reasons: Consequential to change in RR Appendix **30B** interference criteria in 1.4.

NOC

TABLE 2 (WRC-03)

$G_{max} = 10 \log (\eta(\pi D/\lambda)^2)$	
$G(\varphi) = G_{max} - 2.5 \times 10^{-3} \left(\frac{D}{\lambda}\varphi\right)^2$	for $0 < \varphi < \varphi_m$
$G(\varphi) = G_1$	for $\varphi_m \le \varphi < \varphi_r$
$G(\varphi) = 29 - 25 \log \varphi$ $G(\varphi) = -10$	for $\varphi_r \le \varphi < 36.3°$ for $36.3° \le \varphi < 180°$

where:

D : antenna diameter
λ : wavelength
} expressed in the same unit

φ : off-axis angle of the antenna (degrees)

G_1 : gain of the first sidelobe $= -1 + 15 \log \frac{D}{\lambda}$

$$\varphi_m = \frac{20\lambda}{D} - \sqrt{G_{max} - G_1} \quad \text{degrees}$$

$$\varphi_r = 15.85 \left(\frac{D}{\lambda}\right)^{-0.6} \quad \text{degrees}$$

η : antenna efficiency

NOC

1.7 Space station characteristics

NOC

1.7.1 The allotment Plan is based on the use of space station antennas with beams of elliptical or circular cross-section.

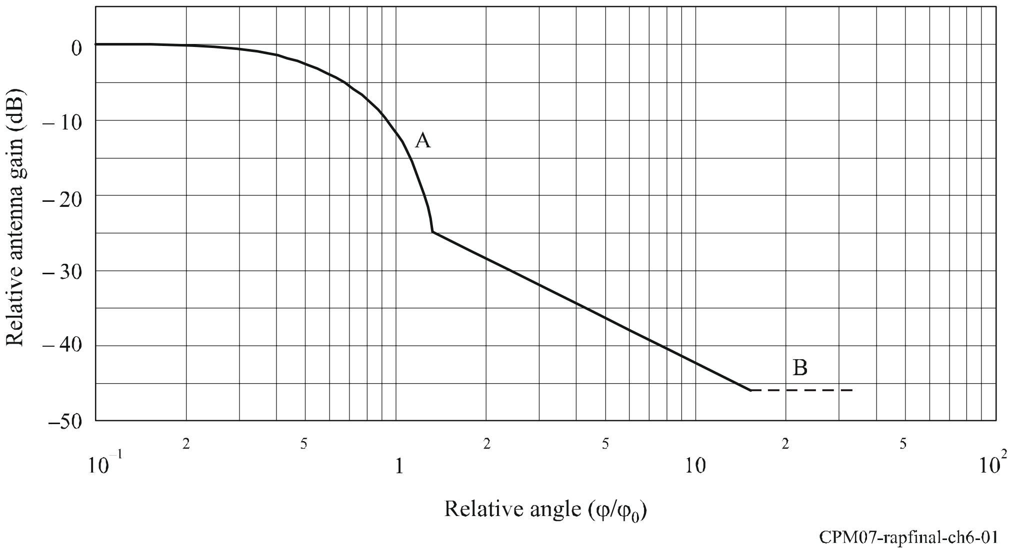
NOC

1.7.2 The antenna radiation characteristics are as shown in Fig. 1. The fast roll-off characteristics shown in Fig. 2 may be used when so specified by administrations.

NOC

FIGURE 1

Reference patterns for satellite antennas



$G_{max} = 44.45 - 10 \log (\varphi_{01} \cdot \varphi_{02})$ dBi

Curve A: dB relative to main beam gain

$-12 (\varphi/\varphi_0)^2$ for $0 \leq (\varphi/\varphi_0) \leq 1.45$

$-(22 + 20 \log (\varphi/\varphi_0))$ for $(\varphi/\varphi_0) > 1.45$

after intersection with Curve B: Curve B

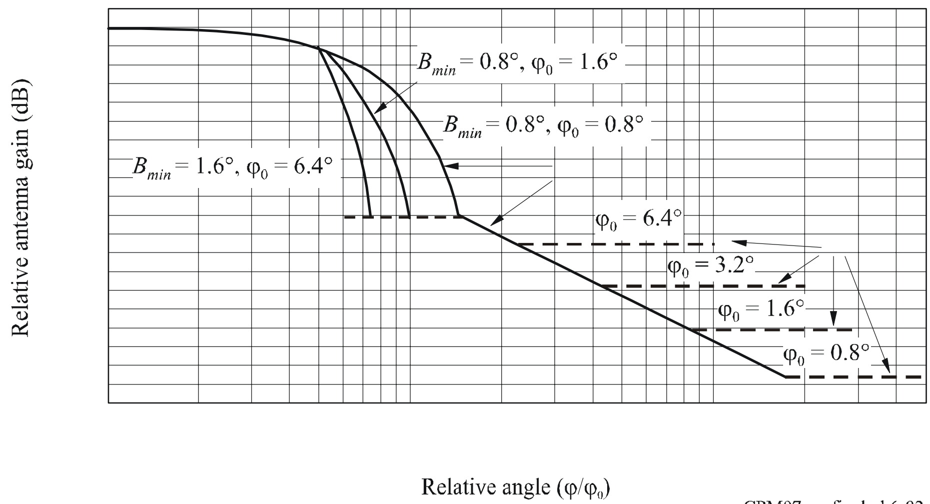
Curve B: Minus the on-axis gain (Curves B in this Figure illustrates the particular case of an antenna with an on-axis gain of 46 dBi)

φ_{01}, φ_{02}: Major and minor axis half-power beamwidth, respectively, of elliptical beam (degrees)

φ_0: Cross-sectional half-power beamwidth in the direction of interest (degrees)

FIGURE 2* (WRC-03)

Reference patterns for satellite antennas with fast roll-off in the main beam



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Curve A: dB relative to main beam gain

$-12\ (\varphi/\varphi_0)^2$ for $0 \le (\varphi/\varphi_0) \le 0.5$

$-12\left[\dfrac{(\varphi/\varphi_0)-x}{B_{min}/\varphi_0}\right]^2$ for $0.5 < (\varphi/\varphi_0) \le \left(\dfrac{1.45 B_{min}}{\varphi_0}+x\right)$

-25.23 for $\left(\dfrac{1.45 B_{min}}{\varphi_0}+x\right) < (\varphi/\varphi_0) \le 1.45$

$-(22 + 20 \log (\varphi/\varphi_0))$ for $(\varphi/\varphi_0) > 1.45$

after intersection with Curve B: Curve B.

Curve B: Minus the on-axis gain (Curve B represents examples of four antennas having different values of φ_0 as labelled in Fig. 2. The on-axis gains of these antennas are approximately 28.3, 34.3, 40.4 and 46.4 dBi, respectively)

where:

φ : off-axis angle (degrees)

φ_0 : cross-sectional half-power beamwidth in the direction of interest (degrees)

$$x = 0.5\left(1-\frac{B_{min}}{\varphi_0}\right)$$

* Figure 2 represents patterns for same combinations of B_{min} and φ_0. (WRC-03)

where:

$$B_{min} = \begin{cases} 0.8° \text{ for } 13/10\text{-}11 \text{ GHz} \\ 1.6° \text{ for } 6/4 \text{ GHz} \end{cases}$$

MOD

1.7.3 The space station receiving system noise temperature referred to the output of the receiving antenna is:

500~~1 000~~ K for the 6 GHz band;

550~~1 500~~ K for the 13 GHz band.

Reasons: These space station noise temperatures are typical of those that can be achieved with modern technology.

NOC

1.7.4 The minimum beamwidth size, in terms of the half-power beamwidth, is 1.6° for the 6/4 GHz band and 0.8° for the 13/10-11 GHz band.

NOC

1.7.5 The space station antenna efficiency is 55%.

NOC

1.7.6 The deviation of the space station antenna beam from its nominal pointing direction is limited to 0.1° in any direction. The rotation accuracy of elliptical beams is ±1.0°.

ADD

<u>1.7.7 The maximum East/West deviation of the space station is 0.05° from its nominal orbital location.</u>

Reasons: This level of East/West deviation is typical of the station keeping accuracy of modern geostationary satellites. The deviation is non-zero and thus should be properly identified and taken into account when developing limits for determining whether an allotment or an assignment made in accordance with the provisions of RR Appendix **30B** is considered to be affected.

NOC

1.8 Bandwidth

The allotment Plan is based on the carrier power averaged over the necessary bandwidth of the modulated carrier and referred to a 1 MHz bandwidth.

}

Alternative 2

{

1 Basic technical characteristics

The allotments in the Plan are based on a reference satellite network with the following assumptions:

1.1 **Type of modulation**

The Plan is independent of modulation characteristics and accessing techniques.~~independent of modulation characteristics and accessing techniques.~~

1.2 **Carrier-to-noise ratio**

The carrier-to-noise ratio (C/N) is as follows:

a) the total link (C/N) under rain faded conditions should exceed a threshold of 12 dB; ~~the up-link *C/N* ratio is equal to 23 dB under rain fading conditions with a minimum earth station transmitter power density of −60 dB(W/Hz) averaged over the necessary bandwidth of the modulated carrier;~~

~~*b)* the down-link *C/N* is equal to 17 dB under rain fading conditions;~~

~~*c)* the total *C/N* is equal to 16 dB under rain fading conditions;~~

~~d~~b) for the 6/4 GHz bands, the threshold is exceeded for 99.9% of the year;~~above *C/N*s are exceeded for 99.95% of the year~~

~~(NOTE – The rain attenuation margin is limited to a maximum of 8 dB);~~

~~e~~c) for the 13/10-11 GHz bands, the threshold is exceeded for 99.8% of the year;~~above *C/N*s are exceeded for 99.9% of the year~~

~~(NOTE – The rain attenuation margin is limited to a maximum of 8 dB);~~

~~f~~d) the gaseous atmospheric attenuation and rain attenuation models used are~~is~~ those~~at~~ described in ~~ITU-R~~Recommendations ITU-R P.676-64 and ITU-R P.618-8, respectively. ~~Report 564-3* (1986).~~

~~1.3 Earth station antenna elevation angle~~

~~The minimum elevation angle for each test point defining the service area is based on the following:~~

~~10° for climatic zones A to G;~~

~~20° for climatic zones H to L;~~

~~30° for climatic zones M and N;~~

~~40° for climatic zone P.~~

~~* This Report is no longer in force.~~

~~Administrations may select lower elevation angles for their service areas. For countries at high latitudes or with dispersed territories, in the absence of such a request, if the above values for minimum elevation angle are unobtainable, then the highest elevation angle leading to a non-zero service arc applies. In mountainous areas, the elevation angles are specified by the administrations concerned.~~

1.34 Interference criteria

The Plan has been prepared with a view to assuring for each allotment an aggregate carrier-to-interference ratio under free-space conditions of 18~~26~~ dB or higher.~~ WRC-03 decided to apply an aggregate carrier-to-interference ratio under free-space conditions of 23 dB for submissions received by the Bureau as from 5 July 2003.~~ ~~(WRC-03)~~

1.5 Polarization

Polarization isolation between satellite networks was not used in the development of the Allotment Plan.

1.6 Earth station characteristics

1.6.1 The diameters of the earth station antennas are:

[7] m for the 6/4 GHz band;

[3] m for the 13/10-11 GHz band.

1.6.2 The earth station receiving system noise temperature referred to the output of the receiving antenna is:

95~~140~~ K for the 4 GHz band;

125~~200~~ K for the 10-11 GHz band.

1.6.3 The earth station antenna efficiency is 70%.

1.6.4 The earth station antenna reference pattern applicable to all Part A allotments is shown in Table 1 below. ~~If so desired by an administration, the improved side-lobe pattern shown in Table 2 below may be used.~~ (WRC-0~~3~~7)

~~TABLE 1~~ ~~(WRC-03)~~

~~$G_{max} = 10 \log (\eta(\pi D/\lambda)^2)$~~	
~~$G(\varphi) = G_{max} - 2.5 \times 10^{-3} \left(\frac{D}{\lambda}\varphi\right)^2$~~	~~for $0 < \varphi < \varphi_m$~~
~~$G(\varphi) = \min (G_1, 29 - 25 \log \varphi)$~~	~~for $\varphi_m \le \varphi \le 19.95°$~~
~~$G(\varphi) = \max (\min (-3.5, 32 - 25 \log \varphi), -10)$~~	~~for $\varphi > 19.95°$~~
~~where:~~ ~~D: antenna diameter~~ ~~λ: wavelength~~ } ~~expressed in the same unit~~ ~~φ: off-axis angle of the antenna (degrees)~~ ~~G_1: gain of the first side lobe $= -1 + 15 \log \frac{D}{\lambda}$~~ ~~$\varphi_m = \frac{20\lambda}{D} \sqrt{G_{max} - G_1}$ degrees~~ ~~η: antenna efficiency~~	

~~1.6.5 In cases where the aggregate~~ C/I ratio ~~of 26 dB cannot be obtained (WRC-03 decided that for the examination of submissions received as from 5 July 2003 the value 23 dB (instead of the of 26 dB) shall be applied), it would be appropriate for the countries concerned to agree on the use of antennas with an improved sidelobe pattern or on other suitable means so as to obtain the above ratio (see Table 2 below).~~ ~~(WRC-03)~~

TABLE 1~~2~~ ~~(WRC-03)~~

$G_{max} = 10 \log (\eta(\pi D/\lambda)^2)$	
$G(\varphi) = G_{max} - 2.5 \times 10^{-3} \left(\frac{D}{\lambda}\varphi\right)^2$	for $0 < \varphi < \varphi_m$
$G(\varphi) = G_1$	for $\varphi_m \leq \varphi < \varphi_r$
$G(\varphi) = 29 - 25 \log \varphi$ $G(\varphi) = -10$	for $\varphi_r \leq \varphi < 36.3°$ for $36.3° \leq \varphi < 180°$

where:

D : antenna diameter
λ : wavelength
} expressed in the same unit

φ : off-axis angle of the antenna (degrees)

G_1 : gain of the first sidelobe $= -1 + 15 \log \frac{D}{\lambda}$

$$\varphi_m = \frac{20\lambda}{D} - \sqrt{G_{max} - G_1} \quad \text{degrees}$$

$$\varphi_r = 15.85 \left(\frac{D}{\lambda}\right)^{-0.6} \quad \text{degrees}$$

η : antenna efficiency

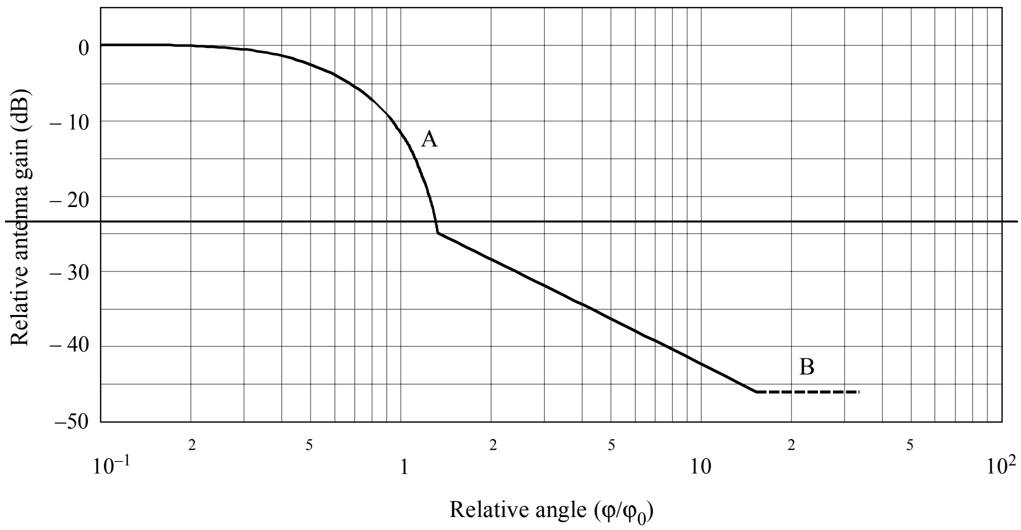
1.7 Space station characteristics

1.7.1 The allotment Plan is based on the use of space station antennas with beams of elliptical or circular cross-section.

1.7.2 The antenna radiation characteristics are as shown in Fig. 1. ~~The fast roll-off characteristics shown in Fig. 2 may be used when so specified by administrations.~~

FIGURE 1

Reference patterns for satellite antennas



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~~G_{max} = 44.45 – 10 log ($\varphi_{01} \cdot \varphi_{02}$) dBi~~

~~*Curve A:* dB relative to main beam gain~~

~~$-12\,(\varphi/\varphi_0)^2$ for $0 \leq (\varphi/\varphi_0) \leq 1.45$~~

~~$-(22 + 20 \log (\varphi/\varphi_0))$ for $(\varphi/\varphi_0) > 1.45$~~

~~after intersection with Curve B: Curve B~~

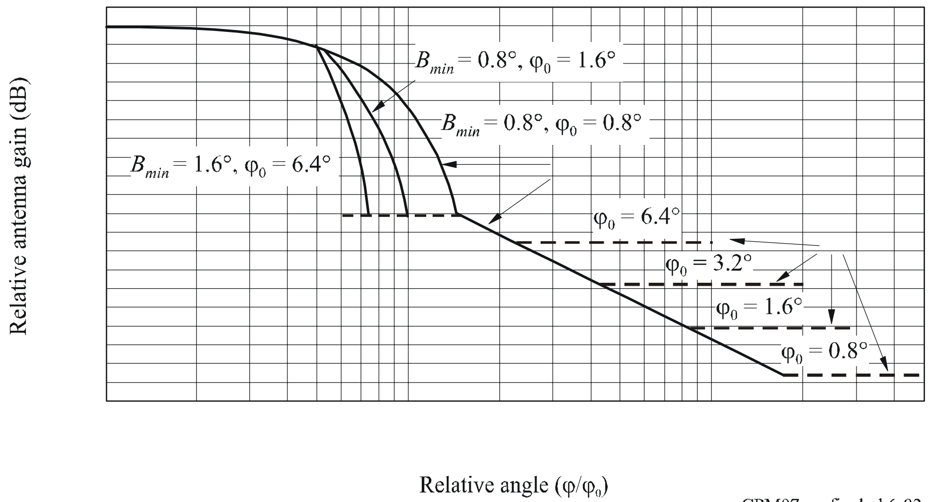
~~*Curve B:* Minus the on-axis gain (Curves B in this Figure illustrates the particular case of an antenna with an on-axis gain of 46 dBi)~~

~~φ_{01}, φ_{02}: Major and minor axis half-power beamwidth, respectively, of elliptical beam (degrees)~~

~~φ_0: Cross-sectional half-power beamwidth in the direction of interest (degrees)~~

FIGURE 2* (WRC-03)

Reference patterns for satellite antennas with fast roll-off in the main beam



Editorial Note: The revised numbering should be Figure 1. Like in the current AP30B, the asterisk in the figure number should be associated with a footnote saying "Figure 1 represents patterns for same combinations of B_{min} and φ_0".

Curve A: dB relative to main beam gain

$-12\ (\varphi/\varphi_0)^2$ for $0 \le (\varphi/\varphi_0) \le 0.5$

$-12\left[\frac{(\varphi/\varphi_0) - x}{B_{min}/\varphi_0}\right]^2$ for $0.5 < (\varphi/\varphi_0) \le \left(\frac{1.45 B_{min}}{\varphi_0} + x\right)$

-25.23 for $\left(\frac{1.45 B_{min}}{\varphi_0} + x\right) < (\varphi/\varphi_0) \le 1.45$

$-(22 + 20 \log (\varphi/\varphi_0))$ for $(\varphi/\varphi_0) > 1.45$

after intersection with Curve B: Curve B.

Curve B: Minus the on-axis gain (Curve B represents examples of four antennas having different values of φ_0 as labelled in Fig. 2. The on-axis gains of these antennas are approximately 28.3, 34.3, 40.4 and 46.4 dBi, respectively)

where:

φ : off-axis angle (degrees)

φ_0 :cross-sectional half-power beamwidth in the direction of interest (degrees)

$$x = 0.5\left(1 - \frac{B_{min}}{\varphi_0}\right)$$

where:

$$B_{min} = \begin{cases} 0.8° \text{ for } 13/10\text{-}11 \text{ GHz} \\ \\ 1.6° \text{ for } 6/4 \text{ GHz} \end{cases}$$

1.7.3 The space station receiving system noise temperature referred to the output of the receiving antenna is:

500~~1 000~~ K for the 6 GHz band;

550~~1 500~~ K for the 13 GHz band.

1.7.4 The minimum beamwidth size, in terms of the half-power beamwidth, is 1.6° for the 6/4 GHz band and 0.8° for the 13/10-11 GHz band.

1.7.5 The space station antenna efficiency is 55%.

1.7.6 The deviation of the space station antenna beam from its nominal pointing direction is limited to 0.1° in any direction. The rotation accuracy of elliptical beams is ±1.0°.

1.7.7 The maximum East/West deviation of the space station is 0.05° from its nominal orbital location.

1.8 Bandwidth

The allotment Plan is based on the carrier power averaged over the necessary bandwidth of the modulated carrier and referred to a 1 MHz bandwidth.

}

SUP

Section B – Generalized parameters used for determining when the assignments of a proposed satellite network are in conformity with the Plan

Reasons: This proposal is consequential of the proposed elimination of the generalized parameters (see § 2.3).

SUP

ANNEX 2 (WRC-03)

Basic data to be furnished in notices relating to stations in the fixed-satellite service entering the design stage using frequency bands of the Plan

Reasons: Consequential to modifications to Articles 6 and 8 now directly giving reference to Appendix **4**.

SUP

ANNEX 3A

Criteria for determining when proposed assignments are considered as being in conformity with the Plan

Reasons: This proposal is consequential to the elimination of the generalized parameters.

SUP

ANNEX 3B

Macrosegmentation concept

Reasons: Satellite networks being deployed are using digital modulation and hence there is no need to order traffic in each allotment band according to high and low density carriers when the traffic tends to be uniform.

SUP

ANNEX 4 (WRC-03)

Limits for determining whether an allotment or an assignment made in accordance with the provisions of Appendix 30B is considered to be affected

SUP

APPENDIX 1 TO ANNEX 4

Method for determination of the single-entry and aggregate carrier-to-interference ratio averaged over the necessary bandwidth of the modulated carrier

Editorial Note: Two alternative sets of protection criteria are provided for this Annex. Each alternative has been drafted in order to be coherent throughout Annexes 1 and 4. Alternative 1 is generally based upon "Study A" while Alternative 2 is generally based upon a combination of "Study B, C and D". See also § 6/1.10/3.1.1.2 – Protection criteria and the table of summarized parameters in § 6/1.10/3.1.1.2.6 – Aggregate and single-entry criteria proposed in the four studies.

Alternative 1

{

ADD

ANNEX 4

Limits for determining whether an allotment or an assignment made in accordance with the provisions of Appendix 30B is considered to be affected

Criteria for determination of affected allotments or assignments

An allotment or assignment shall be considered as being affected by another administration if both of the following conditions are true:

1) When at its nominal orbital position, the calculated single-entry power flux density, at any test point within the service area of the interfered-with satellite network* exceeds any of the applicable pfd limits (provided below) in the applicable frequency bands,

2) The single entry carrier-to-interference ratio of 26 dB for the 13/10-11 GHz bands or 24 dB for the 6/4 GHz bands is not achieved at all test points of the interfered-with satellite network.

* For the purpose of this Annex, "interfered-with satellite network" could refer to operational satellite networks, assignments in the List, networks for which the Bureau has already received complete information, and allotments in the Plan.

When an examination is conducted using condition 1) and the interfering pfd is within the applicable limits at all test points of an interfered-with satellite network, then no further examination is performed. The potentially interfered-with satellite network is considered as not being affected unless, in accordance with § 6.12, an administration whose network is inside the "coordination arc" (defined below) demonstrates on the basis of *C*/*I* criteria, that condition 2) is not met at all test points. In the event that systems which are outside the coordination arc with respect to the interfered-with satellite network exceed applicable pfd limits, those networks are not considered to be affected unless affected administrations can demonstrate on the basis of *C*/*I* criteria, that condition 2) is not met at all test points.

Definitions

For the purpose of assessing the interference from interfering satellite networks into interfered-with satellite networks, the following definitions apply:

"Coordination arc": The arc, measured along the geostationary arc within 9° and 10° of the nominal orbital position in the 13/10-11 GHz and the 6/4 GHz bands respectively.

"pfd": The power flux-density in dB(W/(m^2 · MHz)) at any test point or at any point along the geostationary arc. In the downlink direction, the pfd is calculated by subtracting the spreading loss (S_L) from the e.i.r.p. density of the satellite in dB(W/MHz) on the path from the nominal orbital position in the direction of the test point. In the uplink direction, the pfd is calculated by subtracting the spreading loss (S_L) from the e.i.r.p. density of the earth station in dB(W/MHz) on the path from the test point to points along the geostationary arc separated by θº from the nominal orbital position. The pfd is calculated under free-space propagation conditions where the spreading loss S_L in dB is determined using the following expression:

$$S_L = 10\log_{10}\left(\frac{4\pi}{d^2}\right)$$

where:

d: distance from the satellite at its nominal orbital position on the geostationary arc to the test point on the surface of the Earth (m).

Applicable pfd limits

For the purpose of assessing interference levels into interfered-with satellite networks, under free-space propagation conditions, the power flux density at any test point within the service area associated with any of its frequency assignments in the Plan should not exceed the following values dB(W/(m^2 · Hz)):

Evaluated at 13 GHz, the pfd masks, in dB(W/(m^2 · MHz)), are as follows:

Using an antenna with a 2.4 m to 3 m diameter:

-145.9	for $\theta \leq 0.1°$
$-145.9 + 51.193\ (\theta - 0.1)^2$	for $0.1° < \theta \leq 0.41°$
$26.9\ \theta - 152$	for $0.41° < \theta \leq 0.51°$
$-143.8 + 32.764\ (\theta - 0.1)^2$	for $0.51° < \theta \leq 0.84°$
$-95.22 - \min\ (30.71, 27.97 - 25 \log(\theta - 0.1))$	for $0.84° < \theta \leq 18.24°$
$-95.22 - \max\ (\min\ (-3.5, 30.97 - 25 \log(\theta - 0.1)), -10)$	for $\theta > 18.24°$

Evaluated at 6.875 GHz, the pfd masks, in dB(W/(m^2 · MHz)), are as follows:

Using an antenna with a 4.5 m to 7 m diameter:

-145.3	for $\theta \leq 0.1°$
$-145.3 + 77.952\ (\theta - 0.1)^2$	for $0.1° < \theta \leq 0.27°$
$21.63\ \theta - 148.89$	for $0.27° < \theta \leq 0.38°$
$-143.2 + 32.215(\theta - 0.1)^2$	for $0.38° < \theta \leq 0.88°$
$-94.53 - \min\ (29.2, 27.97 - 25 \log(\theta - 0.1))$	for $0.88° < \theta \leq 18.24°$
$-94.53 - \max\ (\min\ (-3.5, 30.97 - 25 \log(\theta - 0.1)), -10)$	for $\theta > 18.24°$

Evaluated at 11.2 GHz, the pfd masks, in dB(W/(m^2 · MHz)), are as follows:

Using an antenna with a 2.4 m to 3 m diameter:

-166.4	for $\theta \leq 0.1°$
$-166.4 + 38\ (\theta - 0.1)^2$	for $0.1° < \theta \leq 0.58°$
$32.61\ \theta - 176.59$	for $0.58° < \theta \leq 0.76°$
$-162.4 + 24.32\ (\theta - 0.1)^2$	for $0.76° < \theta \leq 0.9°$
$-117.02 - \min\ (29.74, 27.97 - 25 \log(\theta - 0.1))$	for $0.9° < \theta \leq 18.24°$
$-117.02 - \max\ (\min\ (-3.5, 30.97 - 25 \log(\theta - 0.1)), -10)$	for $\theta > 18.24°$

Evaluated at 4.65 GHz, the pfd masks, in dB(W/($m^2 \cdot$ MHz)), are as follows:

Using an antenna with a 4.5 m to 7 m diameter:

-177.6	for $\theta \leq 0.1°$
$-177.6 + 35.66 (\theta - 0.1)^2$	for $0.1° < \theta \leq 0.51°$
$24.21 \theta - 183.95$	for $0.51° < \theta \leq 0.9°$
$-171.6 + 14.74 (\theta - 0.1)^2$	for $0.9° < \theta \leq 1.12°$
$-128.49 - \min (29.54, 27.97 - 25 \log (\theta - 0.1))$	for $1.12° < \theta \leq 18.24°$
$-128.49 - \max (\min (-3.5, 30.97 - 25 \log (\theta - 0.1)), -10)$	for $\theta > 18.24$

Note that the angle θ is the angular separation between the wanted and the interfering satellite networks measured on the geostationary orbital arc. All pfd masks have taken worst case relative orbital separation into account by assuming that each of the wanted and the interfering satellite networks can be 0.05° from their nominal orbital locations (and thus 0.1° closer together) in accordance with the East/West station keeping tolerances in §1.77 of Section A of Annex 1.

Implicit in the derivation of the pfd masks from their applicable single entry carrier-to-interference criteria is the assumption that the aggregate carrier-to-interference ratios are 4 dB lower.

Method of determining satellite networks affected

All submissions for modifications to allotments or additional systems, including those already received by the Bureau but not yet processed on or after the closing date of the WRC-07 shall be examined for their potential of interference to:

– allotments in the Plan,

– assignments in the List,

– assignments for which the Bureau has previously received complete information;

in accordance with this Article as follows:

a) systems which are separated from the nominal orbital position of the interfered-with satellite network by an amount less than the coordination arc and do not exceed the applicable pfd limits will be considered to be in accordance with the provisions of Appendix **30B** unless the affected administration, in accordance with § 6.12, demonstrates that the applicable minimum single entry carrier-to-interference ratio is not achieved at all test points of the interfered-with satellite network;

b) systems which are separated from the nominal orbital position of the interfered-with satellite network by an amount less than the coordination arc and exceed the applicable pfd limits will be examined further to ensure that the applicable minimum single entry carrier-to-interference ratio is achieved at all test points of the interfered-with satellite network;

c) systems which are outside the coordination arc with respect to the interfered-with satellite network and do not exceed the applicable pfd limits will be considered to be in accordance with the provisions of Appendix **30B**;

d) systems which are outside the coordination arc with respect to the interfered-with satellite network and exceed the applicable pfd limits will be considered to be in accordance with the provisions of Appendix **30B** unless the affected administration can demonstrate that the applicable minimum single entry carrier-to-interference ratio is not achieved at all test points of the interfered-with satellite network.

ADD

APPENDIX 1 TO ANNEX 4 (WRC-07)

Method for determination of the single-entry power flux-density averaged over a 1 MHz reference bandwidth

When calculating the pfd, either from a satellite or from an earth station, the actual path length from the space station or earth station under evaluation toward the potentially affected earth station or space station is used. The calculated pfd can then be compared with the pfd limit masks in Annex 4 to determine whether the satellite network under evaluation should be included or excluded from further consideration as a potentially affected network. As the pfd limit masks, which are derived from single-entry *C*/*I* criteria, are intended as a convenient “screening” tool for the facilitation of interference determination between satellite networks, the single-entry and aggregate *C*/*I* between such networks should be calculated using Recommendation ITU-R S.[Method *C*/*I*]. The derivation of single entry pfd limits is described below.

Uplink pfd limits to protect adjacent satellite systems and downlink pfd limits to protect earth stations are in Annex 4 and were derived based on the following expression:

$$pfd_i = pfd_w - \left(\frac{C}{I}\right)_{SE} + (G_{Max} - G(\varphi_{topo})) \tag{1}$$

where pfd_w:

1) in the case of the uplink is derived using an input power density of 0 dBW/MHz at the input to the transmitting earth station; and

2) in the case of the satellite downlink is the representative level for the minimum wanted power flux density. In the case of the 10-11 GHz and the 4 GHz frequency bands, –134 dBW/m^2/MHz and –146 dBW/m^2/MHz respectively.

When calculating the wanted pfd, the following assumptions are used:

– Spreading loss is equivalent to the loss at an elevation angle of 25°.

– Gain of the receiving and transmitting earth station antennas is calculated using the earth station antenna reference pattern in Table 1 to Annex 1 of Appendix **30B** together with the range of antenna sizes listed with the applicable pfd limits in Annex 4. (When two different values of pfd for a given value of θ are obtained, the lesser of the two is used.)

– $G(\varphi_{topo})$ is the gain of the receiving or transmitting antenna where φ_{topo} is the topocentric angle between the wanted and interfering satellite, measured at the test point, in degrees.

In deriving the uplink and downlink pfd masks using equation (1), the following assumptions were used:

– A multiplication factor of 1.1 was used where φ_{topo}=1.1θ, where θ is the minimum geocentric angular separation. This simplification was made for the purpose of deriving the pfd masks since the multiplication factor actually changes depending upon the relative location of two test points.

– The single entry $(C/I)_{SE}$ values derived from expressions (4) through (7) below were used.

The division between the amount of interference on the total link due to contributions of interference on the uplink and the downlink assumes that the same topocentric angular separation between the wanted and the interfering signal on both the uplink and the downlink is maintained. Thus, the following expressions (2) and (3) are true.

$$\left(\frac{c}{i}\right)=\left[\left(\frac{c}{i}\right)_{U/L}^{-1}+\left(\frac{c}{i}\right)_{D/L}^{-1}\right]^{-1} \tag{2}$$

$$\left(\frac{C}{I}\right)_{U/L}-\left(\frac{C}{I}\right)_{D/L}=20\log\left(\frac{f_{U/L}}{f_{D/L}}\right) \tag{3}$$

where:

$\left(\frac{c}{i}\right)_{U/L},\left(\frac{C}{I}\right)_{U/L}$ =carrier to interference ratio of the uplink (as a ratio (dB))

$\left(\frac{c}{i}\right)_{D/L},\left(\frac{C}{I}\right)_{D/L}$ =carrier to interference ratio of the downlink (as a ratio (dB))

$f_{U/L}$ =uplink frequency (GHz)

$f_{D/L}$ =downlink frequency (GHz).

6/4 GHz band

$$\left(\frac{C}{I}\right)_{U/L}=\left(\frac{C}{I}\right)_{Link}+5.03 \tag{4}$$

$$\left(\frac{C}{I}\right)_{D/L}=\left(\frac{C}{I}\right)_{Link}+1.64 \tag{5}$$

13/10-11 GHz band

$$\left(\frac{C}{I}\right)_{U/L}=\left(\frac{C}{I}\right)_{Link}+3.71 \tag{6}$$

$$\left(\frac{C}{I}\right)_{D/L}=\left(\frac{C}{I}\right)_{Link}+2.41 \tag{7}$$

where $\left(\frac{C}{I}\right)_{Link}$ is the single entry *C*/*I* criteria of 26 dB and 24 dB for the 13/10-11 GHz and the 6/4 GHz bands respectively. It is assumed that a difference of 4 dB is maintained such that the aggregate criteria $(C/I)_{aggregate}$ is 4 dB less than the single entry criteria $(C/I)_{SE}$.

Knowing the interfering pfd (pfd_i), wanted pfd level (pfd_w), the receiving earth station antenna gain (G_{max}) and the earth station antenna pattern envelope at any given test point, the single entry *C*/*I* can be calculated using equation (1). By calculating both the uplink and the downlink components of the single-entry *C*/*I*, the total link single-entry *C*/*I* can be calculated using equation (2).

Reasons: Coordination arcs that can be used in association with pfd masks and the methods for examining submissions for their potential for interference (as stipulated in a), b), c) and d)) allow the coordination arc concept to be applied using a "pfd screening tool" (condition 1). Provisions for inclusion in the process of seeking agreement for systems inside the coordination arc are given in a) by using *C*/*I* calculations (condition 2) even when calculated interfering pfd levels are within the pfd mask limits. There is no such provision for inclusion in the process of seeking agreement for systems that meet the pfd limits and are outside the coordination arc such as in c). This distinction is necessary if the coordination arc is to have any significance at all. Note that in case d), affected administrations still have the ability to opt in to the process of seeking agreement should the affected administration be able to demonstrate that their system is affected under condition (2).

}

Alternative 2

{

ADD

ANNEX 4

Limits for determining whether an allotment or an assignment made in accordance with the provisions of Appendix 30B is considered to be affected

Under assumed free-space propagation conditions, the power flux-density (space to Earth) produced on any portion of the surface of the earth of a proposed new or modified assignment in the List shall not exceed the value of [–185.7 dBW/m^2 · Hz] in the 4 GHz band and [–172.9 dBW/m^2 · Hz] in the 10-11 GHz bands. These limits may be exceeded on the territory of any country whose administration has so agreed.

Under assumed free space conditions, the power flux-density (Earth to space) of a proposed new or modified assignment in the List shall not exceed the value of [–204.2 dBW/m^2 · Hz] in the 6 GHz band and [–199.9 dBW/m^2 · Hz] in the 12-13 GHz band towards any location in the geostationary-satellite orbit more than ±10° from the direction of the antenna pointing in the 6 GHz band and more than ±9° from the direction of the antenna pointing in the 12-13 GHz band.

An administration proposing to include a new or modified assignment in the List shall seek the agreement of those administrations whose services are considered to be affected, i.e. administrations:

a) having a frequency allotment in the Plan; *or*

b) having a frequency assignment included in the List or for which complete Appendix **4** information has been received by the Radiocommunication Bureau in accordance with the provisions of § 6.1, and any portion of which falls within the necessary bandwidth of the proposed assignment;

and

c) the minimum orbital separation between the wanted and interfering space stations, under worst-case station-keeping conditions is less than 10° and 9° for networks in the 6/4 and 12-13/10-11 GHz bands respectively.

However, an administration is considered as not being affected if the notifying administration can demonstrate that either of the following conditions are met with respect to the affected network(s) of that administration:

i) with respect to the affected network, under assumed free-space propagation conditions, the power flux-density of the proposed new network does not exceed the following values:

Uplink	6 GHz-band	[–204.2] $dBW/m^2 \cdot Hz$		
pfd limit*:	12-13 GHz band	[–199.9] $dBW/m^2 \cdot Hz$		
Downlink	4 GHz band	[$-235.8+72.7\cdot\theta^2$ $dBW/m^2 \cdot Hz$	for	$\theta < 0.18°$
pfd limit**:		$-218.2+20.2\cdot\log\theta$ $dBW/m^2 \cdot Hz$	for	$0.18° \leq \theta < 1.4°$
		$-222.5+3.46\cdot\theta^2$ $dBW/m^2 \cdot Hz$	for	$1.4° \leq \theta < 2.2°$
		$-210.7+25\cdot\log\theta$] $dBW/m^2 \cdot Hz$	for	$2.2° \leq \theta < 10°$
10-11 GHz bands		[$-224.1+123.2\cdot\theta^2$ $dBW/m^2 \cdot Hz$	for	$\theta < 0.18°$
		$-204.3+20.2\cdot\log\theta$ $dBW/m^2 \cdot Hz$	for	$0.18° \leq \theta < 1.4°$
		$-207.7+2.77\cdot\theta^2$ $dBW/m^2 \cdot Hz$	for	$1.4° \leq \theta < 2.4°$
		$-196.8+25\cdot\log\theta$] $dBW/m^2 \cdot Hz$	for	$2.4° \leq \theta < 9°$

where θ is the nominal orbital separation between the spacecraft.

Editorial Note: The regulatory example below corresponds to Study D of § 6/1.10/3.1.1.2.6 – Aggregate and single-entry criteria. See also § 6/1.10/3.1.1.1.1 "C/N", § 6/1.10/3.1.1.2.4 – Aggregate interference criteria and § 6/1.10/3.1.1.2.5 – Single entry criteria).

{

ii) the effect of the proposed new or modified assignment in the List is that the aggregate *C/I* values of the affected network, taking into account both the up- and the downlink contributions, for all test points of the affected network of the administration does not fall below 18 dB, or if already lower; does not degrade by more than [0.45] dB.

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* This pfd limit is as received at the victim spacecraft and is increased according to the difference between the sensitivity of the victim spacecraft antenna towards the location of the interfering uplink earth station and the maximum sensitivity of this antenna.

** This pfd limit shall be met anywhere within the service area of the victim allotment/assignment.

iii) the effect of the proposed new or modified assignment in the List is that the single entry C/I values of the affected network, taking into account both the up- and the downlink contributions, for all test points of the affected network of the administration does not fall below 24 dB.

}

Editorial Note: The regulatory example below corresponds to Studies B and C of § 6/1.10/3.1.1.2.6 – Aggregate and single-entry criteria. See also § 6/1.10/3.1.1.1.1 "C/N", § 6/1.10/3.1.1.2.4 – Aggregate interference criteria and § 6/1.10/3.1.1.2.5 – Single entry criteria).

{

ii) the effect of the proposed new or modified assignment in the List is that the aggregate C/I values of the affected network, taking into account both the up- and the downlink contributions, for all test points of the affected network of the administration does not fall below $C/I_{overall\ agg} = C/N_{overall}$[ADD 4A] + 7 dB, or if already lower; does not degrade by more than [0.45] dB.

iii) the effect of the proposed new or modified assignment in the List is that the single entry C/I values of the affected network, taking into account both the up- and the downlink contributions, for all test points of the affected network of the administration does not fall below $C/I_{overall\ single\ entry} = C/N_{overall}$[ADD 4B] + 12.2 dB.

}

SUP

ANNEX 5 (WRC-03)

Application of the PDA (predetermined arc) concept

Reasons: This suppression is consequential of the proposed elimination of the PDA concept.

ADD 4A $C/N_{overall}$ = Min {[16] dB, $C/N_{overall\ calculated}$}

ADD 4B $C/N_{overall}$ = Min {[16] dB, $C/N_{overall\ calculated}$}

SUP

ANNEX 6 (WRC-03)

Technical means which may be used to avoid incompatibilities between systems in the fixed-satellite service at their implementation stage

Editorial Note: The draft Resolution below corresponds to Options 1, and 5 of § 6/1.10/3.1.2.6 – "Existing systems":

{ADD

DRAFT RESOLUTION [XXX] (WRC-07)

Satellite systems in Part B of Appendix 30B

See draft Resolution [XXX] in Annex 1.10-1 to the draft CPM text.

}

Agenda item 1.12

"to consider possible changes in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference: "Advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks" in accordance with Resolution 86 (WRC-03)"

Executive summary

Under its Agenda item 1.12, WRC-07 is invited by Resolution 86 (Rev. Marrakesh, 2002) to consider possible changes in the advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, including the associated technical characteristics, and the related Appendices of the RR.

In accordance with Resolution **86 (WRC-03)** which defines the scope and the criteria of Agenda item 1.12, ITU-R has reviewed a number of provisions in the RR with a view to solving difficulties encountered by administrations in the application of the RR, correcting deficiencies, simplifying or updating the procedures and transforming Rules of Procedure into regulatory text.

ITU-R studied 17 different issues and developed corresponding proposals related to a number of provisions contained in RR Articles **5**, **9**, **11**, **21** and **22**, RR Appendices **4**, **5** and **7** as well as in Resolution **86 (WRC-03)**. Considering that these studies, although having the common objectives mentioned above, concern various aspects of the satellite procedures, this summary cannot describe all of them and it is more appropriate to consult each individual issue for further detail.

In response to Resolution **88 (WRC-03)** which requests to undertake studies leading to the rationalization of the coordination and notification procedures in RR Articles **9** and **11**, ITU-R is proposing not to pursue this issue, given the lack of proposals, the extent of the associated studies and the numerous difficulties that were identified as a result of a possible reorganization of the corresponding Articles of the RR.

Resolution 86 (WRC-03) – Scope and criteria to be used for the implementation of Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference

Resolution 88 (WRC-03) – Rationalization of Articles **9** and **11** of the Radio Regulations *requests ITU-R*

"to undertake studies leading to the rationalization of the coordination and notification procedures, taking due account of No. **0.3**"

6/1.12/1 Provisions of RR No. 5.538

6/1.12/1.1 Background

The last sentence of RR No. **5.538** makes reference to the application of pfd limits contained in Table **21-4** of RR Article **21** in the band 27.500-27.501 GHz whereas Table **21-4** does not contain this frequency band.

6/1.12/1.2 Summary of technical and regulatory studies

RR Table **21-4** contains pfd limits in the lower adjacent band (25.25-27.5 GHz), which may be appropriate to the 27.500-27.501 GHz band. The Bureau, conscious of the inconsistency, has been applying these limits to the 27.500-27.501 GHz band. ITU-R has concluded that extension of the pfd limits in the 25.25-27.5 GHz band to the 27.500-27.501 GHz band in RR Table **21-4** would be appropriate.

6/1.12/1.3 Analysis of the results of studies

See § 6/1.12/1.2 above.

6/1.12/1.4 Methods to satisfy the agenda item

It is proposed to include the 27.500-27.501 GHz band in Table **21-4** of RR Article **21** and to apply the pfd limits currently applicable in the lower adjacent frequency band (25.25-27.5 GHz) to the 27.500-27.501 GHz band. Possible examples of modifications of RR Table **21-4** and RR No. **5.538** are provided below.

MOD

TABLE **21-4** *(continued)* (WRC-~~03~~07)

Frequency band	**Service***	**Limit in dB(W/m^2) for angles of arrival (δ) above the horizontal plane**			**Reference bandwidth**
		0°-5°	**5°-25°**	**25°-90°**	
...					
19.3-19.7 GHz 22.55-23.55 GHz 24.45-24.75 GHz 25.25-27.5 GHz 27.500-27.501 GHz	Fixed-satellite (space-to-Earth) Earth exploration-satellite (space-to-Earth) Inter-satellite Space research (space-to-Earth)	–115	$-115 + 0.5(\delta - 5)$	–105	1 MHz

MOD

5.538 *Additional allocation:* the bands 27.500-27.501 GHz and 29.999-30.000 GHz are also allocated to the fixed-satellite service (space-to-Earth) on a primary basis for the beacon transmissions intended for up-link power control. Such space-to-Earth transmissions shall not exceed an equivalent isotropically radiated power (e.i.r.p.) of +10 dBW in the direction of adjacent satellites on the geostationary-satellite orbit.~~ In the band 27.500-27.501 GHz, such space-to-Earth transmissions shall not produce a power flux-density in excess of the values specified in Article **21**, Table **21-4** on the Earth's surface.~~

6/1.12/2 Coordination arc value for triggering the inter-service coordination between broadcasting-satellite service (BSS) networks serving Region 2 and fixed-satellite service (FSS) (space-to-Earth) networks in the band 17.3-17.8 GHz, and among BSS networks serving Region 2 in bands above 17.3 GHz

6/1.12/2.1 Background

Pursuant to Resolution **901 (WRC-03)**, ITU-R studied the appropriate coordination arc value to trigger coordination between BSS networks serving Region 2 in the band 17.3-17.8 GHz and FSS (space-to-Earth) networks in the bands 17.3-17.7 GHz serving Region 1 and 17.7-17.8 GHz in the three Regions. ITU-R also studied the appropriate coordination arc value to trigger coordination among BSS networks serving Region 2 that operate in the bands 17.3-17.8 GHz (space-to-Earth) and 24.75-25.25 GHz (Earth-to-space).

6/1.12/2.2 Summary of technical and regulatory studies

ITU-R undertook detailed studies to determine the appropriate coordination arc among BSS networks serving Region 2 that operate in the bands 17.3-17.8 GHz (space-to-Earth) and 24.75-25.25 GHz (Earth-to-space). A $\Delta T/T$ methodology was used in the studies.

ITU-R also undertook detailed studies to determine the appropriate coordination arc between FSS (space-to-Earth) networks operating in the band 17.3-17.8 GHz serving Region 1 and BSS networks operating in the same band serving Region 2. A $\Delta T/T$ methodology was used in the studies. It is noted that ITU-R has approved a new Recommendation on this subject (ITU-R S.1780).

6/1.12/2.3 Analysis of the results of studies

The studies performed within ITU-R lead to the conclusion that a coordination arc value of ±8°, as compared to the current ±16º, would suffice to trigger coordination between GSO BSS networks serving Region 2 and GSO FSS (space-to-Earth) networks whose service areas are limited to Region 1 in the band 17.3-17.8 GHz. Since this result is a consequence of the natural geographic separation between the land masses of Regions 1 and 2, it is possible to extend it to the case of coordination between GSO FSS networks serving Region 3 and GSO BSS networks serving Region 2.

In addition, considering footnote RR No. **5.517**, from 1 April 2007 FSS (space-to-Earth) networks serving Region 2 shall not claim protection from, nor cause harmful interference to BSS networks serving Region 2 in the band 17.7-17.8 GHz.

The studies performed within ITU-R confirmed that a coordination arc value of ±16º is appropriate between GSO BSS networks serving in Region 2 in the bands above 17.3 GHz. As this is the current value in the RR, no change is required for this particular case.

6/1.12/2.4 Methods to satisfy the agenda item

6/1.12/2.4.1 Frequency band 17.3-17.7 GHz:

Introduction of a coordination arc value of ±8° between GSO BSS networks serving Region 2 and GSO FSS (space-to-Earth) networks serving Region 1 in the band 17.3-17.7 GHz.

Advantages:

– Reduce the number of unnecessary coordination processes while ensuring an adequate identification of the coordination requirements.

Disadvantages:

– None identified at this stage.

6/1.12/2.4.2 Frequency band 17.7-17.8 GHz:

Introduction of a coordination arc value of ±8° between GSO BSS networks serving Region 2 and GSO FSS (space-to-Earth) networks, while noting that RR No. **5.517** applies in Region 2. It should also be noted that this method reduces the FSS/BSS coordination arc from ±16° to ±8° in Region 2.

Advantages:

– Same coordination arc applies to all FSS and BSS networks in the band 17.7-17.8 GHz in the three Regions, thereby simplifying BR examination.

– Reduces the number of unnecessary coordination processes while ensuring an adequate identification of the coordination requirements.

– Harmonizes the coordination arc values between FSS (space-to-Earth) networks serving Region 1 and BSS networks serving Region 2 over the whole band 17.3-17.8 GHz.

Disadvantages:

– The secondary status of FSS (space-to-Earth) vis-à-vis BSS in Region 2 is only delineated via RR No. **5.517** which may cause some confusion as to the regulatory status of FSS networks serving Region 2 relative to BSS networks serving Region 2.

In order to implement the method previously described, RR Appendix **5** could be modified in the following way.

APPENDIX 5 (Rev.WRC-07~~3~~)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

MOD

TABLE 5-1 (*continued*) (Rev.WRC-07~~3~~)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
No. **9.7** GSO/GSO (*cont.*)		3) 17.7-20.2 GHz, (Regions 2 and 3), 17.3-20.2 GHz (Region 1) and 27.5-30 GHz 4) 17.3-17.7 GHz (Regions 1 and 2)	i) Bandwidth overlap, and ii) any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS i) Bandwidth overlap, and ii) a) any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the BSS *or* b) any network in the BSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS		

TABLE 5-1 (*end*) (Rev.WRC-07~~3~~)

Reference of Article 9	Case	Frequency bands (and Region) of the service for which coordination is sought	Threshold/condition	Calculation method	Remarks
		5) 17.7-17.8 GHz	i) Bandwidth overlap, and ii) a) any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the BSS *or* b) any network in the BSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS NOTE – No. **5.517** applies in Region 2.		
		~~4~~6) Bands above 17.3 GHz, except those defined in § 3)	i) Bandwidth overlap, and ii) any network in the FSS and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS (see also Resolution **901 (WRC-03)**)		
		~~6~~7) Bands above 17.3 GHz, except those defined in § 4) and 5)	i) Bandwidth overlap, and ii) any network in the FSS or BSS, not subject to a Plan, and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±16° of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan, except in the case of a network in the FSS with respect to a network in the FSS (see also Resolution **901 (WRC-03)**)		

6/1.12/3 Provisions of RR No. 11.43A

6/1.12/3.1 Background

RR No. **11.43A** relates to the modification of characteristics of assignments already recorded in the MIFR. A number of Rules of Procedure specify conditions and provisions that could be incorporated in these provisions.

The original provisions of RR No. **11.43A** (**S11.43A**) were contained in RR **1548**. The Rule of Procedure on RR **1043** (Ed. 1994) specified the conditions of applicability of RR **1548** on the basis of a decision adopted by WARC Orb-88, in particular that the modified assignment is not subject to a new API, except when the modification concerns the use of a new frequency band. Since then, these conditions have been updated in the Rules of Procedure, but not incorporated in the RR.

WRC-97 modified the provisions of **S11.43A** to specify the deadline of bringing into use of the modified assignment. Circular Letter CR/173 dated 8 January 2002 also provides for practical aspects concerning the application of the procedure contained in RR No. **11.43A**. At its 34th meeting (6-10 September 2004), the RRB adopted modifications to the Rule of Procedure on RR No. **11.43A**. There may be a need to transfer the substance of this Rule of Procedure in RR Article **11** so as to make the main body of the RR more self-contained.

6/1.12/3.2 Summary of technical and regulatory studies

6/1.12/3.2.1 Applicability of the provisions of RR No. 11.43A

With respect to applicable procedures for cases of modifications to assignments to satellite networks which are recorded in the Master Register, WARC Orb-88 decided that, in the case of geostationary-satellite networks, any modification to the basic characteristics of an assignment, in the application of RR No. **11.43A** (former RR **1548**), should be subject only to the coordination procedure (Section II of RR Article **9**). On the basis of this decision, the Bureau does not require an administration to recommence the advance publication procedure, for a modification of a frequency assignment already recorded in the Master Register.

The Rules of Procedure on RR No. **11.43A** specify that the advance publication procedure is not requested unless the modification concerns a change of orbital location by more than ±6° (see also the Rule under RR No. **9.2**). Also, if the modification concerns the notification of assignment(s) in frequency band(s) not covered by other assignment(s) already recorded in the Master Register, RR No. **11.43A** does not apply and it will be processed under RR Nos. **11.2** or **11.9**, as appropriate.

Regarding the criterion relevant for the change of the orbital location, it is understood that the Rules of Procedure refer to the original orbital location contained in the API, together with the procedures relating to transitional situations covered in the Rule of Procedure on RR No. **9.2**. Although it seems appropriate to refer to the API in the case of an assignment not yet brought into use, the original API may not be relevant any longer in the case of an assignment brought into use, as it may date back to more than seven or nine years ago; in this latter case, one approach would be that the orbital location mentioned in the MIFR could be considered as the new starting point of the change. If the orbital location mentioned in the MIFR is used as the starting point, there is a need to consider the case of cumulative changes to the orbital position.

6/1.12/3.2.2 Examination of an assignment communicated under RR No. 11.43A

Pursuant to the provisions of RR No. **11.43A**, the modified assignment is examined under RR Nos. **11.31** to **11.34**. At the stage of examination under RR No. **11.31**, it is understood that the provisions of RR No. **11.36** apply, that is:

– if the modified assignment is not in conformity with RR No. **11.31**, the assignment receives an unfavourable finding under RR No. **11.31** and shall be recorded in the Master Register for information purposes and subject to the application of RR No. **8.5**, only if the administration undertakes that it will be operated in accordance with RR No. **4.4**; otherwise the notice is returned to the administration;

– if the modified assignment is in conformity with RR No. **11.31**, it is further examined by the Bureau with respect to RR Nos. **11.32** to **11.34**, as appropriate.

At the stage of examination under RR No. **11.32**[‡], it is understood that the provisions of RR No. **11.37** apply, that is:

– if the examination with respect to RR No. **11.32** leads to a favourable finding (the coordination requirements remain unchanged or, where appropriate, the probability of harmful interference has not increased), the assignment is recorded in the Master Register. In addition, it is understood that the provisions of RR No. **11.43B** apply, in particular the amended assignment shall retain the original date of entry in the Master Register[§].

‡ The Rule of Procedure on RR No. **11.43A** specifies that the findings with respect to RR No. **11.32** are determined on the basis of the coordination agreements effected to meet the new coordination requirements.

§ The original date of entry in the Master Register is considered to be the date of receipt of the original notice, unless with respect to notices received prior to 1 January 1999, for which the original date of entry in the Master Register is considered to be the date recorded in Column 2A, 2B or 2D, as appropriate. (See Rule of Procedure on RR No. **11.43B**).

– if the examination with respect to RR No. **11.32** leads to an unfavourable finding, the Rule of Procedure on RR No. **11.43A** specifies that the notice is returned to the administration, with an indication of the appropriate action. In addition, it is understood that the administration is requested to apply the relevant coordination procedure in Section II of RR Article **9**.

After having applied the relevant provisions in Section II of RR Article **9**, the Bureau considers that the notice communicated under RR No. **11.43A** is also for recording purposes.

6/1.12/3.3 Analysis of the results of studies

See § 6/1.12/3.2 above.

6/1.12/3.4 Methods to satisfy the agenda item

It is proposed to modify the provisions of RR No. **11.43A** to incorporate the content of the Rule of Procedure on RR No. **11.43A** so as to specify the criteria associated with the applicability of RR No. **11.43A**.

Possible examples of modification to RR No. **11.43A**, showing two possible options, are provided below.

Option A

MOD

11.43A A notice of a change in the characteristics of an assignment already recorded, as specified in Appendix **4**, shall be examined by the Bureau under Nos. **11.31** to **11.34**, as appropriate. Any change to the characteristics of an assignment that has been ~~notified~~recorded and confirmed as having been brought into use shall be brought into use within five years from the date of the notification of the modification. Any change to the characteristics of an assignment that has been ~~notified~~recorded but not yet brought into use shall be brought into use within the period provided for in No. **11.44.** Cumulative changes to the orbital position shall not exceed ±6° from the reference orbital location*, otherwise the procedure of Section I of Article **9** shall apply. If the modification concerns the notification of assignment(s) in frequency band(s) not covered by other assignment(s) already recorded in the Master Register, this provision does not apply and the notice will be processed under No. **11.2** or **11.9**, as appropriate.

ADD

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* If this provision (No. **11.43A**) is applied no later than seven years from the application of No. **9.1** for the network, the reference orbital location is the orbital location mentioned in the relevant information submitted under No. **9.1**; otherwise, the reference orbital location is the initial orbital location that has been recorded in the MIFR.

Reasons: Regarding the reference orbital location, even though it is appropriate to refer to the API in the case of an assignment for which the seven-year period has not elapsed, the original API may not be relevant any longer in case its date of receipt is more than seven years before the date of request for application of RR No. **11.43A**; in the latter case, it is therefore recommended that the initial orbital location mentioned in the MIFR be considered as the new starting point of the change.

Option B

It was noted that, under RR No. **9.2**:

– For the filings received as of 5 July 2003, the reference orbital position is defined by the advance publication information (API). Considering the ±6° orbital modification flexibility of the filing for the coordination request, the maximum orbital modification range of the assignment recorded in the MIFR would be changed from ±6° orbital range to ±12° again for a satellite network after seven years as of the API. This may contradict the trend of the change to narrow orbital range of the orbital position;

– Under § 6 of the Rules of Procedure of RR No. **9.2**, it is stipulated that “Networks that have changed their orbital position by 6 to 12° in the period between 3 June 2000 and 4 July 2003 may retain that position and may modify it in the direction of the reference position. Once their orbital position enters into the segment of ±6° from the reference position, further modifications are restricted to that segment”. The additional footnote in Option A however may reopen the two directions of the orbital modification;

Under this option, another example modification method is proposed below.

MOD

11.43A A notice of a change in the characteristics of an assignment already recorded, as specified in Appendix **4**, shall be examined by the Bureau under Nos. **11.31** to **11.34**, as appropriate. Any change to the characteristics of an assignment that has been ~~notified~~recorded and confirmed as having been brought into use shall be brought into use within five years from the date of the notification of the modification. Any change to the characteristics of an assignment that has been ~~notified~~recorded but not yet brought into use shall be brought into use within the period provided for in No. **11.44.** Cumulative changes to the orbital position shall be in accordance with No. **9.2**. If the modification concerns the notification of assignment(s) in frequency band(s) not covered by other assignment(s) already recorded in the Master Register, this provision does not apply and the notice will be processed under No. **11.2** or **11.9**, as appropriate.

6/1.12/4 Provisions of RR No. 11.47

6/1.12/4.1 Background

RR No. **11.47** still refers to an "extension granted under No. **11.44**", whereas WRC-03 modified the provisions of RR No. **11.44** by suppressing the possibility of extending the date of bringing into use. Also, the current Rules of Procedure on RR No. **11.47** provide the notifying administration with the possibility to modify the notified date of bringing into use of an assignment, within the regulatory 7-year time limit referred to in RR No. **11.44**.

6/1.12/4.2 Summary of technical and regulatory studies

WRC-03 modified RR No. **11.44** by suppressing the possibility of extension of the date of bringing into use. However, WRC-03 may have omitted to review the provisions of RR No. **11.47** in light of this decision. ITU-R has concluded that these provisions may be amended in order to be consistent with the decision taken by WRC-03 on RR No. **11.44**.

In addition, RR No. **11.47** states that "Any frequency assignment provisionally recorded under this provision shall be brought into use by the date specified in the notice, …". It has been noted that the date of bringing into use specified in the notice is an anticipated date, subject to change. The Rule of Procedure on RR No. **11.47** provides the notifying administration with the possibility to modify this expected date of bringing into use without any justification, within the limits prescribed in RR No. **11.44**. It was therefore recognized that the assignment should not be cancelled if it is not brought into use by this expected date, but only the non-respect of the 7-year period should lead to cancellation. The Rule of Procedure (RoP) also addresses the procedures to be followed by the Radiocommunication Bureau (BR) when the responsible administration fails to notify the bringing into use of provisionally recorded assignments by the date recorded in the Master Register.

RR No. **11.47** also refers to the provisional recording of assignments to terrestrial stations, as it mentions the extension provided under RR No. **11.45** as well as earth stations. ITU-R has concluded that no change is needed in this area.

6/1.12/4.3 Analysis of the results of studies

See § 6/1.12/4.2 above.

6/1.12/4.4 Methods to satisfy the agenda item

It is proposed to modify the provisions of RR No. **11.47** to suppress the reference to any extension granted under RR No. **11.44**, pursuant to WRC-03 decision to modify RR No. **11.44**. It is also proposed to remove the requirement to bring into use assignments to space stations provisionally recorded in the Master Register by the date specified in the notice, as this date is considered as a planned date of bringing into use and the only regulatory deadline is the latest date provided by RR No. **11.44**. Under this approach, the Bureau sends a reminder only when the administration fails to advise the Bureau that the provisionally recorded assignment has been brought into use in accordance with RR No. **11.44**. A possible example of modification of RR No. **11.47** is provided below.

Finally, it is proposed not to amend the provisions of RR No. **11.47** in respect of earth stations and terrestrial services.

MOD

11.47 All frequency assignments notified in advance of their being brought into use shall be entered provisionally in the Master Register. Any frequency assignment to a space station provisionally recorded under this provision shall be brought into use no later than the end of the period provided under No. **11.44**. Any other frequency assignment provisionally recorded under this provision shall be brought into use by the date specified in the notice, or by ~~the date of expiry of~~ the extension granted under No. ~~**11.44** or No.~~ **11.45**, as the case may be. Unless the Bureau has been informed by the notifying administration of the bringing into use of the assignment, it shall, no later than fifteen days before the notified date of bringing into use, in the case of an earth station, or the end of the regulatory period established under No. **11.44** or No. **11.45**, as appropriate, send a reminder requesting confirmation that the assignment has been brought into use within the regulatory period. If the Bureau does not receive that confirmation within thirty days following the notified date of bringing into use, in the case of an earth station, or the period provided under No. **11.44** or No. **11.45**, as the case may be, it shall cancel the entry in the Master Register. ~~Within thirty days of such an assignment being brought into use, the notifying administration shall so inform the Bureau. If the Bureau does not receive that confirmation within the above period, after sending a reminder, it shall cancel the entry.~~ The Bureau shall ~~however~~ inform the administration concerned before taking such action.

6/1.12/5 Provisions of RR No. 22.2

6/1.12/5.1 Background

RR No. **22.2** is the provision that governs the sharing between non-geostationary satellite (non-GSO) systems vis-à-vis geostationary satellite (GSO) networks in the fixed-satellite service (FSS) and the broadcasting-satellite service (BSS), except when it is explicitly disabled through a footnote in RR Article **5** through a Resolution adopted by a World Radiocommunication Conference (WRC). In the light of the decisions taken by the last WRCs, clarification may be needed concerning the respective status of non-GSO systems and GSO networks in cases where RR No. **22.2** applies.

6/1.12/5.2 Summary of technical and regulatory studies

The application of RR No. **22.2** in specific cases was reviewed at different WRCs. The decisions taken by WRCs can be classified into two categories:

1) Disabling RR No. **22.2** and introducing a coordination mechanism between non-GSO and GSO (RR Nos. **9.12A** and **9.13**), thus granting equal rights to both of them. For instance, this approach was taken by WRC-97 in RR Nos. **5.523A** to **5.523D** (non-GSO FSS and feeder link for non-GSO MSS in the bands 28.6-29.4/18.8-19.7 GHz); by WRC-2000 in RR Nos. **5.418A** to **5.418C** (non-GSO BSS(s) systems in 2 630-2 655 MHz); and by WRC-03 in RR Nos. **5.417B** to **5.417D** (non-GSO BSS(s) systems in 2 605-2 630 MHz).

2) Quantifying RR No. **22.2** by adopting specific regulatory mechanisms (epfd limits applicable to non-GSO systems) confirming the status of non-GSO systems vis-à-vis GSO systems as stipulated in RR No. **22.2**, but also by clarifying that, for the sake of consistency, non-GSO systems shall not claim protection from GSO networks. For instance, this approach was taken by WRC-2000 in RR Nos. **5.441**, **5.484A**, **5.487A** and **5.516** (non-GSO FSS in some parts of the 14-13/10-11-12 GHz and 30/20 GHz bands).

6/1.12/5.3 Analysis of the results of studies

The approach taken by various WRCs when reviewing the application of RR No. **22.2** has therefore always been consistent: either non-GSO systems and GSO networks are put on an equal footing (i.e. non-application of RR No. **22.2** and introduction of a coordination mechanism), or non-GSO systems shall not cause unacceptable interference to nor claim protection from GSO networks (RR No. **22.2** continues to apply). This latter case is not a new concept in the RR (cf. definition of a secondary service, RR Nos. **5.43** and **5.43A**) and, as already mentioned, fully clarifies the status of non-GSO systems vis-à-vis GSO networks in those specific cases where RR No. **22.2** applies.

6/1.12/5.4 Methods to satisfy the agenda item

It is proposed to modify RR No. **22.2** so that it clarifies that NGSO systems shall not claim protection from GSO networks. A possible example of modification to RR No. **22.2**, by reusing a wording similar to that contained in RR Nos. **5.441**, **5.484A**, **5.487A** and **5.516** is provided below.

MOD

22.2 § 2 1) Non-geostationary-satellite systems shall not cause unacceptable interference to or claim protection from geostationary-satellite ~~systems~~ networks in the fixed-satellite service and the broadcasting-satellite service operating in accordance with these Regulations. No. **5.43A** does not apply in this case. (WRC-~~9~~07)

In the example modification above, the last sentence referring to the non-application of No. **5.43A** is required in order to avoid any inconsistency between the operational nature of No. **22.2** which refers to the notion of unacceptable interference (level to be agreed between the administrations concerned taking into account, *inter alia*, footnote **A.22.1**) and the regulatory nature of No. **5.43A** (implicitly applicable unless otherwise specified because of the occurrence of the words "nor claim protection from") which refers to the notion of harmful interference.

6/1.12/6 Coordination distances for cases involving ground-based earth stations and aircraft stations

6/1.12/6.1 Background

Airborne stations can fly at altitudes substantially exceeding the height of other kinds of terrestrial stations such that the propagation model used in the case-by-case calculation of coordination distances in RR Appendix **7** is technically inapplicable. Table 10 of RR Appendix **7** has addressed aircraft stations using predetermined coordination distances, but certain cases above 3 GHz are not addressed in Table 10.

6/1.12/6.2 Summary of technical and regulatory studies

Technical studies focused on establishing an appropriate predetermined coordination distance for situations involving aircraft stations and ground-based earth stations that are not presently addressed in Table 10 of RR Appendix **7**. A review of that Table indicated that there are missing entries for the cases of frequency sharing between aircraft stations and ground-based earth stations operating with space stations using the geostationary satellite orbit (GSO), as well as the non-geostationary satellite orbit (NGSO) not providing feeder links for the mobile-satellite service.

Three other cases involving aircraft stations (in a terrestrial mobile service) are covered in the first and last rows of Table 10, all of which specify a predetermined coordination distance of 500 km. The first row of Table 10 in RR Appendix **7** addresses sharing between ground-based earth stations and mobile (aircraft) terrestrial stations in bands below 1 GHz to which RR No. **9.11A** applies. It also addresses bands to which RR No. **9.11A** applies in the 1-3 GHz frequency range that are shared between ground-based mobile earth stations and mobile (aircraft) terrestrial stations. The last row addresses non-GSO MSS feeder-link earth stations (all bands) and mobile (aircraft) terrestrial stations.

These existing 500 km coordination distances for aircraft stations were based on an analysis conducted by the ITU's International Frequency Registration Board (ex-IFRB) and adopted in IFRB Rule of Procedure H.25 (see ex-IFRB Circular Letter No. 736, 4 May 1988). The 500 km distance is 50 km greater than the 450 km radio horizon distance for an aircraft at 12 km altitude and a refracted interfering signal path having a 4/3 Earth radius. The ex-IFRB analysis and the aircraft station cases presently addressed in Table 10 of RR Appendix **7** support the use of a predetermined coordination distance of 500 km for the aircraft stations that are not addressed in Table 10 of RR Appendix **7**. ITU-R has conducted sharing studies for aircraft stations that transmit telemetry at frequencies near 4 GHz. This telemetry system is the only type of aeronautical mobile system above 3 GHz for which ITU-R has representative characteristics. The results showed that actual separation distances needed between the aircraft stations and receiving earth stations operating at the same frequencies could range from 106 km to 500 km depending on the antenna pointing geometry. As the intent of coordination under RR Appendix **7** is to assume the near-worst-case scenario in order to trigger for coordination, 500 km is the correct value for inclusion in Table 10 of RR Appendix **7**.

Frequency scaling effects indicate that a coordination distance of 500 km is appropriate at higher frequencies in the absence of representative aeronautical mobile system parameters. This can be revisited in the years to come when aeronautical system parameters become available.

6/1.12/6.3 Analysis of the results of studies

The three technical assessments summarized above all indicate that a 500 km predetermined coordination distance is appropriate for bands above 3 GHz that are shared between aircraft stations and earth stations.

6/1.12/6.4 Methods to satisfy the agenda item

To cover all cases of sharing between aircraft stations and ground-based earth stations above 3 GHz, a new row could be added to the bottom of Table 10 of RR Appendix **7** as follows.

MOD

APPENDIX 7 (Rev.WRC-07~~3~~)

Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz

TABLE 10 (Rev.WRC-07~~3~~)

Predetermined coordination distances

Frequency sharing situation		**Coordination distance (in sharing situations involving services allocated with the equal rights) (km)**
Type of earth station	**Type of terrestrial station**	
…	…	…
Ground based in bands in which the frequency sharing situation is not covered in rows above	Mobile (aircraft)	500

6/1.12/7 RR Appendix 4 data element (C.8.d.2); contiguous satellite bandwidth

6/1.12/7.1 Background

WRC-03 reviewed Annex 2 of RR Appendix **4**. Among the modifications, WRC-03 added an item C.8.d.2 "*Contiguous satellite bandwidth*". This item was introduced in RR Appendix **4** in order to cover the specific cases where a transmitting satellite transponder would operate in a multi-carrier mode, where the aggregate bandwidth of the transmitted carriers would be different and lower than the transponder bandwidth.

This item was introduced in RR Appendix **4** in order to help administrations to conduct coordination in these cases of multi-carrier transmissions. The relationship between this item and item C.3.a "*Bandwidth of the assigned frequency band*" is considered here.

6/1.12/7.2 Summary of technical and regulatory studies

ITU-R considered this issue and noted that after about two years of practice (revised RR Appendix **4** entered into force on 1 January 2004), it appears that the values provided by administrations for this item is most of the time equal to the bandwidth of the assigned frequency band (i.e. transponder bandwidth, item C.3.a). A survey in published data in BR circulars shows that around 90% of the filed values for these two items are identical. Among the 10% of the cases where the values are different, around 15% show a contiguous bandwidth higher than the assigned frequency band.

6/1.12/7.3 Analysis of the results of studies

ITU-R came to the conclusion that some modifications to RR Appendix **4** are necessary in order to:

– alleviate the task of administrations to fill in twice the same values, in 90% of the cases;

– avoid a burden on BR to request the missing information to administrations (this frequently appears when administrations submit a copy of a filing that was submitted before 1 January 2004, thus without this item C.8.d.2);

– diminish the appearance of inexact entries in the BR database, in up to 1.5% of the cases.

6/1.12/7.4 Methods to satisfy the agenda item

The method is to modify Annex 2 to RR Appendix **4**, in order to request the submission of item C.8.d.2 only if it is different from the item C.3.a.

In order to implement the method previously described, RR Appendix **4** could be modified in the following way:

MOD

APPENDIX 4 (Rev.WRC-07~~3~~)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

MOD

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations (WRC-~~03~~07)

MOD

Items in Appendix	*C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA*
...	
C.8.d.2	each contiguous satellite bandwidth For the maximum saturated peak envelope power of the satellite transponder, this corresponds to the bandwidth of each transponder Required only for a space-to-Earth or space-to-space link, and only if different from item C.3.a
...	

6/1.12/8 Resolution 88 (WRC-03)

6/1.12/8.1 Background

Resolution **88 (WRC-03)** resolves that WRC-07 review the results of studies to be undertaken by the ITU-R on the rationalization of RR Articles **9** and **11**, taking due account of RR No. **0.3**, and take appropriate action.

6/1.12/8.2 Summary of technical and regulatory studies

In spite of the merits of a rationalization of RR Article **9**, it appears to have several disadvantages:

– the extent of work required to achieve this rationalization;

– the risk of disrupting the objectives of RR Articles **9** and **11** and their relationships with other provisions of the RR;

– the difficulties that may be caused to administrations and the Bureau as a result of the consequential renumbering of provisions which are now familiar to them.

These disadvantages appear to have discouraged the efforts of administrations in undertaking the necessary studies.

6/1.12/8.3 Analysis of the results of studies

See § 6/1.12/8.2 above.

6/1.12/8.4 Methods to satisfy the agenda item

In the absence of such studies, it is therefore concluded that no changes are advisable under this agenda item and Resolution **88 (WRC-03)** needs to be suppressed.

SUP

RESOLUTION 88 (WRC-03)

Rationalization of Articles 9 and 11 of the Radio Regulations

6/1.12/9 RR Appendix 4 – Advance Publication Information for non-GSO satellite systems not subject to coordination**

6/1.12/9.1 Background

Currently RR Appendix **4** makes many fields optional for the case of "Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article **9**". While most administrations have been supplying this information with their API filings, there have been instances where the information was only made available at the stage of notification, thus making interference analysis difficult or too late to benefit either concerned administration. ITU-R has considered the possibility of making these data mandatory or otherwise at the stage of API.

** The Administrations of Algeria, Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Mauritania, Oman, Qatar, Syrian Arab Republic and Tunisia reserve their position until such time as the BR will confirm that such request will not cause additional costs and will serve the needs of the majority of the Membership and not a few operators.

6/1.12/9.2 Summary of technical and regulatory studies

For the case of “Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article **9**”, the following data elements in RR Appendix **4** are not mandatory:

– the necessary bandwidth;

– the carrier frequency or frequencies of the emission;

– the maximum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier type;

– the minimum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier type;

– the minimum power density, in dB(W/Hz), supplied to the input of the antenna for each carrier type; and

– the required C/N ratio.

This information, however, is necessary in order to assess the particulars of any anticipated interference that may be caused by the planned satellite network or system and vice versa and, if necessary, communicate these particulars to the publishing administration and the Bureau under RR No. **9.3**. Therefore under the current RR, any administration wishing to determine the impact of the system described in the API on its own systems or vice versa needs to contact the publishing administration asking for such information while further delaying the interference analysis. Having this information only at the notification stage makes any analysis too late to benefit either administration.

The data elements that are currently optional in the Advance Publication Information need to be made mandatory in order to ensure that administrations have the necessary information to perform meaningful interference analyses at an early stage, concentrating the communications between the relevant administrations, when it is necessary, on additional information or for further discussions on interference mitigation techniques.

6/1.12/9.3 Analysis of the results of studies

During the discussions between the publishing and the affected administrations in order to resolve any difficulties, some adjustments may be necessary to the initially identified carrier frequency and/or necessary bandwidth for each carrier within the upper and lower limits of the frequency range. It is considered appropriate that these adjustments, as long as they remain within the upper and lower limits of the frequency range should not affect examination by the Bureau during the notification process and therefore should not require any amendment to the API.

Interference assessment and coordination between non-geostationary systems from different administrations have been possible, so far, either because the non-mandatory information was already provided or coordination happened through informal links between space agencies, e.g. the Space Frequency Coordination Group. However, in many instances, request for information through the Bureau has been needed to assess the interference situation. Furthermore with the advent of private remote sensing satellites, the benefit of informal coordination through the Space Frequency Coordination Group may not be available.

ITU-R considers that making the above-mentioned information mandatory will greatly facilitate the interference analysis without imposing any additional burden on the Bureau or on the publishing administration, such as of additional examination and costs. This will facilitate the examination of this information and reduce the unnecessary correspondence between administrations.

6/1.12/9.4 Methods to satisfy the agenda item

The following provides an example of modifications to RR Appendix **4** that could facilitate and minimize the exchange of necessary information for determining whether unacceptable interference may be caused by a planned non-GSO satellite network not subject to coordination under Section II of RR Article **9**.

APPENDIX 4 (Rev.WRC-0~~3~~7)

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-0~~3~~7)

MOD

Table of characteristics to be submitted for space and radio astronomy services (Rev.WRC-0~~3~~7)

Items in Appendix	*C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA*	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9
C.7	**NECESSARY BANDWIDTH AND CLASS OF EMISSION** (in accordance with Article **2** and Appendix **1)** For advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article **9**, changes to this information within the limits specified under C1 shall not affect consideration of notification under Article **11**	
C.7.a	the necessary bandwidth and the class of emission: for each carrier In the case of Appendix **30B**, required only for notification under Article 8	~~O~~X
C.7.b	the carrier frequency or frequencies of the emission(s)	~~O~~X
C.8	**POWER CHARACTERISTICS OF THE TRANSMISSION**	
C.8.a	**For the case where individual carriers can be identified:**	
C.8.a.1	the maximum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier type Required if C.8.b.1 is not provided	~~O~~+
C.8.a.2	the maximum power density, in dB(W/Hz), supplied to the input of the antenna for each carrier type[2] Required if C.8.b.2 is not provided	+

Items in Appendix	*C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA*	**Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9**
C.8.b	**For the case where it is not appropriate to identify individual carriers:**	
C.8.b.1	the total peak envelope power, in dBW, supplied to the input of the antenna For coordination or notification of an Appendix **30A** earth station the values shall include the maximum range of power control Required if C.8.a.1 is not provided	~~O~~+
C.8.b.2	the maximum power density, in dB(W/Hz), supplied to the input of the antenna[2] For coordination or notification of an Appendix **30A** earth station the values shall include the maximum range of power control Required if C.8.a.2 is not provided	+
C.8.c.1	the minimum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier type If not provided, the reason for absence under C.8.c.2	~~O~~+
C.8.c.2	if C.8.c.1 is not provided, the reason for absence of the minimum value of the peak envelope power	+
C.8.c.3	the minimum power density, in dB(W/Hz), supplied to the input of the antenna for each carrier type[2] If not provided, the reason for absence under C.8.c.4	~~O~~+
C.8.c.4	if C.8.c.3 is not provided, the reason for absence of the minimum power density	+
C.8.d.1	the maximum total peak envelope power, in dBW, supplied to the input of the antenna for each contiguous satellite bandwidth For a satellite transponder, this corresponds to the maximum saturated peak envelope power Required only for a space-to-Earth or space-to-space link	O

Items in Appendix	*C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA*	**Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9**
C.8.d.2	each contiguous satellite bandwidth For the maximum saturated peak envelope power of the satellite transponder, this corresponds to the bandwidth of each transponder Required only for a space-to-Earth or space-to-space link	O
C.8.e.1	for space-to-Earth, Earth-to-space or space-to-space links. for each carrier type, the greater of either the carrier-to-noise ratio, in dB, required to meet the performance of the link under clear-sky conditions or the carrier-to-noise ratio, in dB, required to meet the short-time objectives of the link inclusive of necessary margins If not provided, the reason for absence under C.8.e.2	~~O~~+
C.8.e.2	if C.8.e.1 is not provided, the reason for absence of the carrier-to-noise ratio	+

Reasons: Modify the "Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article **9**" to make additional technical information mandatory at the API stage.

6/1.12/10 RR Appendix 4 – Active and passive sensors on satellites

6/1.12/10.1 Background

In response to a request by the scientific and research community responsible for operation of active and passive sensors on satellites (as defined in RR Nos. **1.182** and **1.183**), and in coordination with that community, a set of technical data relating to these sensors was established for use by all administrations for registration purposes. The Director of the Radiocommunication Bureau (BR) published Circular Letter CR/137 of 14 February 2000, which requests administrations, when submitting advance publication information to the Bureau on planned Earth exploration-satellite service (EESS)/space research service (SRS) satellite networks in which active and/or passive sensors are to be deployed, to kindly also submit specific information as attached to that Circular Letter.

Following CR/137, the Director of the BR in his Report to the World Radiocommunication Conference 2003 (WRC-03)[††] indicated that there were additional data requirements for the EESS/SRS contained in CR/137 and suggested that the conference might wish to consider reviewing RR Appendix **4** to include the additional information. However, no decision was taken by the conference in this regard.

Currently, the additional information submitted to BR in accordance with Circular Letter CR/137 is being scanned and published in the International Frequency Information Circular (IFIC) (Space services) as an attachment to the Special Section related to the relevant advanced publication (API) only. It is not reproduced in the IFIC at the time of notification. The scanned documents are being published once on IFIC CD-ROM. These data are neither stored in the Space Network System (SNS) database nor published on Space Radiocommunication Station on CD-ROM.[‡‡] Therefore, the information concerning EESS and SRS satellite networks where active and passive sensor systems are to be deployed is not easily available after publication of the API on the relevant IFIC. This information is useful in analyzing the compatibility of these sensors with systems operating in other services and facilitates their advance publication, notification and the subsequent entry in the Master International Frequency Register (MIFR).

6/1.12/10.2 Summary of technical and regulatory studies

To address the need, the data elements contained in RR Appendix **4** were reviewed to determine which existing elements should be required to best facilitate the advance publication and notification of active and passive sensors on satellites. This issue has been previously addressed at the Working Party of the Special Committee meeting last year and was discussed at a meeting of sensor experts and members of the ITU-R Space Services Department staff in November 2005.

In order to facilitate the review by administrations of the BR IFIC (Space Services) and to provide ability to distinguish active and passive sensors from other applications within the EESS/SRS in Advanced Publication and Notification information, the Bureau created[*] four new classes of stations for Table 3 in the Preface to the BR IFIC (Space Services), namely E1 – Space research (active sensor) space station, E2 – Space research (passive sensor) space station, E3 – Earth exploration-satellite (active sensor) space station and E4 – Earth exploration-satellite (passive sensor) space station. These new symbols are to be used by the administrations when submitting their notices.

[††] See Document 4(Add.3) at: http://www.itu.int/md/choice_md.asp?id=R03-WRC03-C-0004!A3!MSW-E&lang=e&type=sitems.

[‡‡] SRS-on-CD – see at: http://www.itu.int/ITU-R/software/space/srscdrom/index.html.

[*] See Circular Letter CR/256 dated 15 May 2006.

Providing a mechanism for incorporation of sensor information into Annex 2 of RR Appendix **4** would allow international visibility on the use of the spectrum by EESS/SRS (active and passive).

6/1.12/10.3 Analysis of the results of studies

ITU-R has identified the minimum set of parameters that are needed for properly describing the active and passive sensors. It appears that these parameters can largely be covered by the current RR Appendix **4** data elements and it would therefore be necessary to incorporate the four newly created classes of space stations (EESS passive, EESS active, SRS passive, SRS active) to which the identified subset of RR Appendix **4** parameters would be associated.

BR has noted that current implementation of Circular Letter CR/137 requires manual intervention and including this data directly in RR Appendix **4** would simplify the data entry process for BR.

6/1.12/10.4 Methods to satisfy the agenda item

An example is provided on modifications of Annex 2 to RR Appendix **4** by adding a few new lines and comments for specific data elements requested for active and passive sensors. An example of a possible modification of Tables B and C of Annex 2 to RR Appendix **4** is given below (no change is required for Tables A and D).

APPENDIX 4 (Rev.WRC-0~~3~~7)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

MOD

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations[2] (Rev.WRC-0~~3~~7)

Table of characteristics to be submitted for space and radio astronomy services (Rev.WRC-0~~3~~7)

Items in Appendix	***B – CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA***	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
…	…	…	…	…	…	…	…	…	…	…	…	…
B.4	**ADDITIONAL CHARACTERISTICS FOR NON-GEOSTATIONARY SPACE STATION ANTENNA**										**B.4**	
B.4.a.1	the reference number of each orbital plane in which the space station antenna characteristics are used			**X**		**X**					B.4.a.1	

[2] See footnote 1.

Items in Appendix	*B – CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA*	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
B.4.a.2	if the antenna characteristics of a space station are not common to every satellite in the specified orbital plane, the reference number of each satellite in the specified orbital plane, on which the space station antenna characteristics are used			+		+					B.4.a.2	
B.4.a.3	**For a space station submitted in accordance with Nos. 9.11A, 9.12 , 9.12A or for active or passive sensors on board a non-geostationary-satellite network not subject to coordination under Section II of Article 9:**										B.4.a.3	
B.4.a.3.a	**For the orientation angles of the satellite transmitting and receiving antenna beams:**										B.4.a..3.a	
B.4.a.3.a.1	the orientation angle alpha, in degrees, (see most recent version of Recommendation ITU-R SM.1413)			**X**		**X**					B.4.a.3.a.1	
B.4.a.3.a.2	the orientation angle beta, in degrees, (see most recent version of Recommendation ITU-R SM.1413)			**X**		**X**					B.4.a.3.a.2	
B.4.b	**For a space station submitted in accordance with Nos. 9.11A, 9.12 or 9.12A:**										B.4.b	
~~B.4.b.1~~	~~**For the orientation angles of the satellite transmitting and receiving antenna beams:**~~	-	-	-	-	-	-	-	-	-	~~B.4.b.1~~	-
~~B.4.b.1.a~~	~~the orientation angle alpha, in degrees, (see most recent version of Recommendation ITU-R SM.1413)~~	-	-	-	-	~~**X**~~	-	-	-	-	~~B.4.b.1.a~~	-
~~B.4.b.1.b~~	~~the orientation angle beta, in degrees, (see most recent version of Recommendation ITU-R SM.1413)~~	-	-	-	-	~~**X**~~	-	-	-	-	~~B.4.b.1.b~~	-
B.4.b.2	the satellite antenna gain $G(\theta_e)$ as a function of elevation angle (θ_e) at a fixed point on the Earth					**X**					B.4.b.2	
…	…	…	…	…	…	…	…	…	…	…	…	…

Items in Appendix	*C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA*	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
C.2	**ASSIGNED FREQUENCY (FREQUENCIES)**										**C.2**	
C.2.a.1	the assigned frequency (frequencies), as defined in No. **1.148** – in kHz up to 28 000 kHz inclusive – in MHz above 28 000 kHz to 10 500 MHz inclusive – in GHz above 10 500 MHz If the basic characteristics are identical, with the exception of the assigned frequency, a list of frequency assignments may be provided In the case of Appendix **30B**, required only for notification under Article 8 In the case of a satellite network in the Earth exploration-satellite or space research service, not required for passive sensors For Advance Publication Information this is only required for active sensors			+	~~X~~+	~~X~~+	X	X	X	+	C.2.a.1	
C.2.a.2	the channel number							X	X		C.2.a.2	
C.2.b	the centre of the frequency band observed – in kHz up to 28 000 kHz inclusive – in MHz above 28 000 kHz to 10 500 MHz inclusive – in GHz above 10 500 MHz In the case of a satellite network in the Earth exploration-satellite or space research service, required only for passive sensors For Advance Publication Information this is only required for passive sensors			+	+	+					C.2.b	X
C.2.c	if the frequency assignment is to be filed under No. **4.4**, an indication to that effect			+	+	+	+				C.2.c	+

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C.3	**ASSIGNED FREQUENCY BAND**										**C.3**	
C.3.a	the bandwidth of the assigned frequency band, in kHz (see No. **1.147**) In the case of Appendix **30B**, required only for notification under Article 8 In the case of a satellite network in the Earth exploration-satellite or space research service, not required for passive sensors For Advance Publication Information this is only required for active sensors			+	~~X~~+	~~X~~+	X	X	X	+	C.3.a	
C.3.b	the bandwidth of the frequency band, in kHz, observed by the station In the case of a satellite network in the Earth exploration-satellite or space research service, not required for active sensors For Advance Publication Information this is only required for passive sensors			+	+	+					C.3.b	X
C.4	**CLASS OF STATION AND NATURE OF SERVICE**										**C.4**	
C.4.a	the class of station, using the symbols from the Preface	X	X	X	X	X	X	X	X		C.4.a	X
C.4.b	the nature of service performed, using the symbols from the Preface	X	X	X	X	X	X				C.4.b	X

Items in Appendix	C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
C.5	**RECEIVING SYSTEM NOISE TEMPERATURE**										**C.5**	
C.5.a	the lowest total receiving system noise temperature, in kelvins, referred to the output of the receiving antenna of the space station Not required for active or passive sensors on board satellite networks in the Earth exploration-satellite or space research service			~~X~~+	~~X~~+	~~X~~+			X	X	C.5.a	
C.5.b	the lowest total receiving system noise temperature, in kelvins, referred to the output of the receiving antenna of the earth station under clear-sky conditions This value shall be indicated for the nominal value of the angle of elevation when the associated transmitting station is onboard a geostationary satellite and, in other cases, for the minimum value of the angle of elevation						X				C.5.b	
C.5.c	the overall receiving system noise temperature, in kelvins, referred to the output of the receiving antenna										C.5.c	X
C.5.d	**For active sensors in the space research and Earth exploration-satellite services**										C.5.d	
C.5.d.1	the system noise temperature at the output of the signal processor			X	X	X					C.5.d.1	
C.5.d.2	the receiver noise bandwidth			X	X	X					C.5.d.2	

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C.7	**NECESSARY BANDWIDTH AND CLASS OF EMISSION** (in accordance with Article **2** and Appendix **1)**										**C.7**	
C.7.a	the necessary bandwidth and the class of emission: for each carrier In the case of Appendix **30B**, required only for notification under Article 8 Not required for active or passive sensors on board satellite networks in the Earth exploration-satellite or space research service			**O**	~~X~~+	~~X~~+	**X**	**X**	**X**	+	C.7.a	
C.7.b	the carrier frequency or frequencies of the emission(s) Not required for active or passive sensors on board satellite networks in the Earth exploration-satellite or space research service			**O**	**C**	**C**	**C**				C.7.b	
C.8	**POWER CHARACTERISTICS OF THE TRANSMISSION**										**C.8**	
C.8.a	**For the case where individual carriers can be identified:**										C.8.a	
C.8.a.1	the maximum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier type Required if either C.8.b.1 or C.8.b.3.a is not provided			**O**	+	+	**C**				C.8.a.1	
C.8.a.2	the maximum power density, in dB(W/Hz), supplied to the input of the antenna for each carrier type[2] Required if either C.8.b.2 or C.8.b.3.b is not provided			+	+	+	**O**				C.8.a.2	

Items in Appendix	*C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA*	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
C.8.b	**For the case where it is not appropriate to identify individual carriers:**										C.8.b	
C.8.b.1	the total peak envelope power, in dBW, supplied to the input of the antenna For coordination or notification of an Appendix **30A** earth station the values shall include the maximum range of power control Required if either C.8.a.1 or C.8.b.3.a is not provided			**O**	+	+	+[1]	**X**	**X**		C.8.b.1	
C.8.b.2	the maximum power density, in dB(W/Hz), supplied to the input of the antenna[2] For coordination or notification of an Appendix **30A** earth station the values shall include the maximum range of power control Required if either C.8.a.2 or C.8.b.3.b is not provided			+	+	+	+[1]	**X**	**X**	**X**	C.8.b.2	
C.8.b.3	**For the case of active sensors on board a satellite network in the Earth exploration-satellite or space research service**										C.8.b.3	
C.8.b.3.a	the mean peak envelope power, in dBW, supplied to the input of the antenna			**O**		+					C.8.b.3.a	
C.8.b.3.b	the mean power density, in dB(W/Hz), supplied to the input of the antenna[2]			**O**		+					C.8.b.3.b	

Items in Appendix	*C – CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA*	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
<u>C.8.c</u>	**<u>Minimum power values</u>** <u>Not required for active or passive sensors on board satellite networks in the Earth exploration-satellite or space research service</u>										<u>C.8.c</u>	
C.8.c.1	the minimum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier type If not provided, the reason for absence under C.8.c.2			**O**	+	+	+ [1]				C.8.c.1	
C.9	**INFORMATION ON MODULATION CHARACTERISTICS** <u>Not required for active or passive sensors on board satellite networks in the Earth exploration-satellite or space research service</u>										**C.9**	
C.9.a	**For each carrier, according to the nature of the signal modulating the carrier:**										C.9.a	
C.10	**TYPE AND IDENTITY OF THE ASSOCIATED STATION(S)** (the associated station may be another space station, a typical earth station of the network or a specific earth station) <u>Not required for active or passive sensors on board satellite networks in the Earth exploration-satellite or space research service</u>										**C.10**	
C.10.a	**For an associated space station:**										C.10.a	

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C.11	**SERVICE AREA(S)** Not required for active or passive sensors on board satellite networks in the Earth exploration-satellite or space research service										**C.11**	
C.14	**~~Not used~~DESCRIPTION OF ACTIVE AND PASSIVE SENSOR SYSTEMS**										**C.14**	
C.14.a	**For active sensors**										C.14.a	
C.14.a.1	the pulse length, in µS			**X**	**X**	**X**					C.14.a.1	
C.14.a.2	the pulse repetition frequency, kHz			**X**	**X**	**X**					C.14.a.2	
C.14.a.3	the chirp rate in MHz/µS			**X**	**X**	**X**					C.14.a.3	
C.14.b	**For passive sensors**										C.14.b	
C.14.b.1	the sensitivity threshold, in kelvins			**X**	**X**	**X**					C.14.b.1	
C.15	**DESCRIPTION OF THE GROUP(S) REQUIRED IN THE CASE OF NON-SIMULTANEOUS EMISSIONS**										**C.15**	
C.15.a	if part of an exclusive operation group, the group identification code							+	+	+	C.15.a	

6/1.12/11 Radionavigation-satellite service in the bands 1 215-1 300 MHz and 1 559-1 610 MHz

6/1.12/11.1 Background

WRC-2000 added the space-to-space direction to the existing radionavigation-satellite service (RNSS) (space-to-Earth) allocations in the bands 1 215-1 300 MHz and 1 559-1 610 MHz, along with RR No. **5.329A**. WRC-03 added RR No. **5.328B**, which applied coordination between two non-GSO RNSS systems and between non-GSO and GSO RNSS systems in the bands 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz under RR Nos. **9.12**, **9.12A** and **9.13** after 1 January 2005, without specifying direction (i.e. space-to-Earth or space-to-space). Coordination between GSO RNSS networks is addressed by RR No. **9.7**.

RR No. **9.11A** applies the coordination provisions of RR Nos. **9.12** to **9.16** where the requirement to coordinate is included in a footnote to the Table of Frequency Allocations. The RRB considered the application of RR No. **9.11A** to the bands in RR No. **5.329A** (i.e. 1 215-1 300 MHz and 1 559-1 610 MHz), which are subject to the condition "shall not impose any additional constraints on other systems or services" and interpreted the regulations as excluding RNSS (space-to-space) assignments in the bands given in RR No. **5.329A** from any obligation to coordinate with other services and with RNSS (space-to-Earth), but as obliging these RNSS (space-to-space) assignments to coordinate with each other.

Resolution **610 (WRC-03)** requires certain administrations planning or operating RNSS systems or networks, under specified circumstances involving bilateral coordination, to inform certain other administrations (with a copy to the Bureau) whether they have met certain criteria regarding submission of Advance Publication information and the entry into binding agreements for the manufacture, procurement, and launch of RNSS systems and networks.

6/1.12/11.2 Summary of technical and regulatory studies

The phrase "shall not impose any additional constraints on other systems or services operating in accordance with the Table" in RR No. **5.329A** is ambiguous. ITU-R considered the decisions of the RRB and developed example modifications to RR Nos. **5.328B** and **5.329A** to clarify this situation. These example modifications limit the application of RR Nos. **9.12, 9.12A** and **9.13** with respect to the radionavigation-satellite service (space-to-space) in the bands 1 215-1 300 MHz and 1 559-1 610 MHz. Additionally, to ensure that the obligation on RNSS (space-to-space) networks operating under RR No. **5.329A** are also adequately reflected for geostationary RNSS (space-to-space) networks (a coordination scenario not encompassed by RR Nos. **9.12**, **9.12A**, and **9.13**), the modification to RR No. **5.328B** also refers to RR No. **9.7**.

ITU-R considered the application of Resolution **610 (WRC-03)** to RNSS (space-to-space) networks and systems in the bands covered by RR No. **5.329A** and determined it was appropriate to require this data of transmitting RNSS (space-to-space) stations only. Many RNSS receivers utilize the transmitting RNSS signal for navigation purposes and are independent from the RNSS transmitting network. It is not necessary or practical to require application of Resolution **610 (WRC-03)** for such stations.

Modifications to RR Nos. **5.329A** and **5.328B** are needed in order 1) to reflect the Rules of Procedure on RR No. **9.11A** with respect to RNSS (space-to-space) networks and systems in the frequency bands addressed in RR No. **5.329A**; and 2) to limit the application of Resolution **610 (WRC-03)** for RNSS (space-to-space) networks and systems in the frequency bands addressed in RR No. **5.329A** to transmitting stations only.

6/1.12/11.3 Analysis of the results of studies

See § 6/1.12/11.2.

6/1.12/11.4 Methods to satisfy the agenda item

An example of how RR No. **5.329A** can be modified to clarify that "other systems" in RR No. **5.329A** refers to the radionavigation-satellite service (space-to-Earth) and that "services" refers to services other than the radionavigation-satellite service is provided below. Modifications to RR No. **5.328B** are also needed to make it clear that the application of the coordination procedure in RR Nos. **9.7, 9.12**, **9.12A** and **9.13** to RNSS (space-to-space) systems and networks is only with respect to other radionavigation-satellite service (space-to-space) systems and networks in the bands 1 215-1 300 MHz and 1 559-1 610 MHz and in these bands to limit the application of Resolution **610 (WRC-03)** in such coordinations to transmitting space stations.

MOD

5.328B The use of the bands 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz by systems and networks in the radionavigation-satellite service for which complete coordination or notification information, as appropriate, is received by the Radiocommunication Bureau after 1 January 2005 is subject to the application of the provisions of Nos. **9.12**, **9.12A** and **9.13**. Resolution **610 (WRC-03)** shall also apply; however, in the case of radionavigation-satellite service (space-to-space) networks and systems, Resolution **610 (WRC-03)** shall only apply to transmitting space stations. In accordance with No. **5.329A**, for systems and networks in the radionavigation-satellite service (space-to-space) in the bands 1 215-1 300 MHz and 1 559-1 610 MHz the provisions of Nos. **9.7, 9.12, 9.12A** and **9.13** shall only apply with respect to other systems and networks in the radionavigation-satellite service (space-to-space). (WRC-0~~3~~7)

MOD

5.329A Use of systems in the radionavigation-satellite service (space-to-space) operating in the bands 1 215-1 300 MHz and 1 559-1 610 MHz is not intended to provide safety service applications, and shall not impose any additional constraints on ~~other~~radionavigation-satellite service (space-to-Earth) systems or on other services operating in accordance with the Table. (WRC-~~2000~~07)

6/1.12/12 Provisions of RR No. 11.49

ITU-R considered a proposal to modify the provisions of RR No. **11.49** aiming at clarifying their application. This proposal consisted in setting a maximum number of times these provisions could be applied, excluding cases of force majeure. It was recognized that the concept of force majeure was difficult for the Bureau to evaluate; in fact, this was one of the reasons why WRC-03 decided to suppress RR No. **11.44I**. This proposal also consisted in reducing the period of 18 months for an administration to communicate to the Radiocommunication Bureau that its assignment has been suspended.

The provisions of RR No. **11.49** are mainly applied by administrations in the case of malfunction of a satellite and allow the continuation of the rights of the assignment to be protected. ITU-R has concluded that two years, as provided in RR No. **11.49**, is the appropriate period for the malfunctioning spacecraft to be replaced to allow for actual situations.

ITU-R has concluded that there should be no changes in the provisions of RR No. **11.49**.

6/1.12/13 Provisions of RR No. 9.1

6/1.12/13.1 Background

There has been a requirement in Article **9** of the RR, under RR No. **9.1**, that the date of receipt of a complete coordination request by the Bureau shall not be earlier than six months after the date of receipt of the corresponding advanced publication information (API) for satellite networks requiring coordination under Section II of RR Article **9**, even if both sets of information are submitted to the Bureau at the same time. The purpose and effects of this required six-month period have been questioned by some administrations. This issue was first raised at the meeting of the Special Committee (Geneva, 4-8 December 2006).

6/1.12/13.2 Summary of technical and regulatory studies

The required six-month period between the receipt by the Bureau of an API and a related coordination request is intended for administrations to consider and potentially comment upon the information contained in the API as well as for the administration responsible for the proposed satellite network to take into consideration the comments of other administrations.

As a consequence of the simplification of the RR at WRC-95, the API for satellite networks requiring coordination under Section II of RR Article **9** provides limited information (e.g. orbital position and frequency bands) and as such, some administrations are of the view that there is little for administrations to review and comment upon.

The possibility of having an API and a coordination submission receivable at the same time by the Bureau could be beneficial to administrations on the one hand, since they would not have to wait six months for the Bureau to process the coordination information of their proposed satellite network, but, on the other hand, would not allow the filing administrations to benefit from comments received in response to the information published in the API.

6/1.12/13.3 Analysis of the results of studies

ITU-R has considered two methods to address this issue.

Method A: Retention of the six-month minimum period

View in favour of Method A

Some administrations are of the view that, considering the difficulties in selecting an optimal orbital location and frequencies for a new satellite system due to the congested geostationary orbit, the current six-month minimum period may be beneficial for the responsible administration to evaluate and determine an appropriate orbital position and corresponding frequencies. These administrations believe that this period gives a useful opportunity for the administration submitting the API to take into account the comments received from administrations reviewing the API in order to make necessary modifications to its network before submitting the coordination request. These administrations further believe that, from the financial point of view under cost recovery, the six-month minimum period for the evaluation and determination of the final orbital position and frequencies could avoid the unnecessary filing expenses possibly resulting from the submission of modified coordination request information or new filing charges. Finally, these administrations feel that, from the practical point of view, despite this six-month minimum period, the coordination could still be initiated informally between the concerned administrations, especially when the coordination information has been submitted to the Bureau.

View not in favour of Method A

Other administrations are of the view that, as a consequence of the simplification of the RR at WRC-95, the current API for satellite networks requiring coordination under Section II of RR Article **9** includes limited information, e.g. orbital position and frequency bands, and provides little for administrations to review and comment upon during the current six month comment period. As such, these administrations believe that the six-month minimum period can delay the coordination process with other administrations if an administration objects to respond to a request to coordinate because the coordination information has not yet been officially received by the Bureau. These administrations believe that the six month minimum period could result in an orbital slot that was available at the time of filing of the API being no longer available six months later due to a conflicting coordination request, tied to an earlier filed API within ± 6º, having been received by the Bureau in the intervening period. As such, this six-month minimum period can add considerable uncertainty to the overall satellite filing process.

Method B: Elimination of six-month minimum period

View in favour of Method B

Some administrations believe that, if the six-month minimum period is eliminated and the Bureau can receive the API and CR/C from the responsible administration simultaneously, the formal coordination process for the satellite network with other concerned administrations may commence sooner than under the current situation. These administrations further believe that this option would also facilitate selection of a suitable orbital position as it could be expected that the responsible administration would perform a careful evaluation on selecting a suitable orbital position and relevant frequencies for their future or new system and, having found such a suitable orbital location, the situation would not have six months to change. These administrations believe that this would have the effect of removing uncertainty in the availability of the orbital location. This option would afford additional flexibility to administrations, while at the same time preserving the possibility for administrations to submit only an API, and to submit the corresponding CR/C information at any time within the following 24 months.

View not in favour of Method B

Other administrations are of the view that, in this method, the filing administration could lose its opportunity to see if it can use its desired orbital location six months in advance by submitting simple API information. If an administration were to submit an API and coordination request information (CR/C) at the same time with an uncertain orbital location and frequencies, the life time of that satellite network would undesirably last for seven years under RR No. **11.44** instead of two years in case of the existing separate submission of API and CR/C. As a consequence, additional increase of coordination requirements could be anticipated for the networks coming in later stage. In addition, there would be no chance or flexibility for the responsible administration to adjust the final orbital position and frequencies, unless it were to submit a modified coordination request information or a new filing. These modified coordination request submissions would result in extra filings and contribute cost to administrations.

6/1.12/13.4 Methods to satisfy the agenda item

6/1.12/13.4.1 Method A

This method proposes no changes to the current Regulations.

6/1.12/13.4.2 Method B

This method proposes to modify RR No. **9.1** to remove the requirement that the date of receipt of the complete coordination request by the Bureau shall not be earlier than six months after the date of receipt of the advanced publication information, for satellite networks requiring coordination under Section II of RR Article **9**. A possible example of modification to these provisions is provided below.

MOD

9.1 Before initiating any action under this Article or under Article **11** in respect of frequency assignments for a satellite network or a satellite system, an administration, or one[9] acting on behalf of a group of named administrations, shall, prior to the coordination procedure described in Section II of Article **9** below, where applicable, send to the Bureau a general description of the network or system for advance publication in the International Frequency Information Circular (BR IFIC) not earlier than seven years and preferably not later than two years before the planned date of bringing into use of the network or system (see also No. **11.44**). The characteristics to be provided for this purpose are listed in Appendix **4**. The coordination or notification information may also be communicated to the Bureau at the same time~~; it~~. When coordination is required by Section II of Article **9**, the coordination information shall be considered as having been received by the Bureau ~~not earlier than six months after the date of receipt of the information for advance publication where coordination is required by Section II of Article **9**~~upon its actual date of receipt. Where coordination is not required by Section II, notification shall be considered as having been received by the Bureau not earlier than six months after the date of publication of the advance publication information. (WRC-0~~3~~7)

6/1.12/14 Resolution 86 (WRC-03)

6/1.12/14.1 Background

Resolution 86 (Rev. Marrakesh, 2002) deals with the review and update of the various procedures (advance publication, coordination, notification and recording in the MIFR) for frequency assignments pertaining to satellite networks. This Resolution was initially adopted by PP-98 after an in-depth review of these procedures was conducted by the VGE (Voluntary Group of Experts) and induced profound modifications in the RR. The main purpose of this Resolution is to invite the WRCs to review and update the various steps in the regulatory procedures for space networks/systems.

PP-02 modified this Resolution by settling the global framework of the review of the space procedures, including aspects related to equitable access to the orbit/spectrum resource and to cost savings in BR and the administrations. PP-02 also invited WRC-03 to determine the scope and criteria to be used for the implementation of this Resolution.

In response to this invitation, WRC-03 adopted Resolution **86 (WRC-03)** which contains the various criteria to be used in the context of the corresponding WRC agenda item.

The 2006 Plenipotentiary Conference considered modifying Resolution 86 (Rev. Marrakesh**,** 2002) and concluded not to change that Resolution due to the disagreement on the scope of modification. However, PP-06 decided to invite WRC-07 to consider the matter further and report to PP-10.

6/1.12/14.2 Summary of technical and regulatory studies

The main objectives of Resolution 86 of the Plenipotentiary Conference was, through WRCs, to continually review and update the advance publication, coordination and notification procedure, including the associated technical characteristics, and the related Appendices of the RR so as to reflect the latest technologies as well as achieve additional simplification and cost saving for the Radiocommunication Bureau and administrations.

Some administrations were of the following view (View A):

> During the last seven years several issues which were not related to any agenda item of these WRCs were submitted to the Conferences under the coverage of this Resolution, which created difficulties. In other words, those issues that, due to the lack of agreement at a previous WRC were not included in the agenda of subsequent WRCs, were brought back to the subsequent WRC under the coverage of Resolution **86 (WRC-03)**.
>
> The process of simplification of the space services regulatory procedure have now come up to a certain degree of saturation after 15 years of continual efforts since the establishment of the Voluntary Group of Expert established by Nice Plenipotentiary Conference. During this long period several back and forth modifications in terms of modifying a given procedure by certain group/conference and going back to the initial text by the subsequent conference or making cosmetic changes which in fact did not help have occurred. Sometimes this so called simplification has resulted in a complication.
>
> Moreover, tasks of WRCs become more and more complex. Due to the fact that, on the one hand, there are fewer regulatory experts attending these WRCs who could carefully analyze the complexity and determine: whether or not the proposal leads to simplification or complication; whether the proposed modification has subregional, regional or worldwide character; or the proposal is aimed to resolve the problem of a particular country or a limited number of countries while creating difficulties for the majority of the membership.

Very often, these so-called simplification, if adopted due to lack of sufficient time for investigation and careful examination or adopted by consensus by exhaustion, would require a series of Rules of Procedure which the majority of the ITU membership have no time or resources to examine or comment at the stage of the adoption by the RRB. These Rules of Procedure then become additional regulatory procedures that cause considerable difficulties for the membership to understand and apply.

Another example of the difficulties which have been or are being caused by the implementation of this Resolution is that under the coverage of the Resolution, very often a fairly simple well established Rule of Procedure, when being converted to the regulatory procedure for inclusion in the RR, become more complex to understand due to the expansion of the text or due to expansion of the intent of the Rule. Such a conversion may go beyond the objectives on which the initial Rules were based.

Some other administrations were of the following view (View B):

It is necessary that WRCs continuously update the procedures for satellite networks/systems and pursue their review within the framework established by Resolution 86 of the Plenipotentiary Conference. Such framework is necessary for administrations to study these procedures and submit necessary/relevant proposals to WRCs in order to remove deficiencies and inconsistencies in the corresponding provisions of the RR. Retaining a Resolution at the level of the Plenipotentiary Conference ensures a permanent item on WRC agendas, by adequately taking care of the issue of the orbit/spectrum access, as referred to in Article 44 of the ITU Constitution. In addition, Resolution **86 (WRC-03)** provides a suitable framework for the implementation of Resolution 86 (Rev. Marrakesh, 2002) by defining the scope of the agenda item and listing the various criteria to be applied. Combining this agenda item with the permanent item dealing with the report of the Director of the BR would deprive the administrations of their rights to submit their own proposals, as the Director is free to include in his report only the issues he wishes to raise at the WRC.

6/1.12/14.3 Analysis of the results of studies

See § 6/1.12/14.2 above.

6/1.12/14.4 Methods to satisfy the agenda item

ITU-R considered two possible methods to respond to the invitation of the 2006 Plenipotentiary Conference.

Some administrations were of the view (View A) that Resolution **86 (WRC-03)** should be suppressed and place the operative text under Agenda item 7.1 of WRCs (which is a standing agenda item for each and every WRC) as described in the example below. Through that agenda item, these administrations believed that all sound and logical simplification in the space service procedure could be submitted by the Director to the subsequent WRCs together with its report on the inconsistencies and difficulties encountered in the application of the RR.

Another possibility is to modify Resolution **86 (WRC-03)** or replace it by a new one, with a view to resolve the current deficiencies and difficulties of Resolution 86 (Rev. Marrakesh, 2002), conditioned by a possible conclusion by WRC-07 to recommend to PP-10 to suppress Resolution 86 (Rev. Marrakesh, 2002).

Some other administrations were of the view (View B) that the framework provided by Resolution 86 (Rev. Marrakesh, 2002) and Resolution **86 (WRC-03)** is satisfactory and both these Resolutions should be retained, possibly with some appropriate updating that would need to be developed.

Example (View A)

The scope and objectives of Resolution **86 (WRC-03)** as stipulated/outlined in the "*resolves*" section of that Resolution could be incorporated in the future WRCs standing Agenda item 7.1, second indent, and the Resolution be modified or suppressed, as appropriate. If Resolution **86 (WRC-03)** is retained, necessary modification to this Resolution is required in order to avoid pressure to the WRC by adding issues which are not in line with Resolution 86 (Rev. Marrakesh, 2002). If Resolution **86 (WRC-03)** is to be suppressed, the above-mentioned incorporation into WRC Agenda item 7.1 could be as follows:

MOD

Agenda item 7.1 of future WRCs: to consider and approve the Report of the Director of the Radiocommunication Bureau:

– on the activities of the Radiocommunication Sector since WRC-03;

– on any difficulties or inconsistencies encountered in the application of the Radio Regulations, including any suggested improvements to the procedures pertaining to advance publication, coordination, notification and recording of frequency assignments for satellite networks or systems; and

– on action in response to Resolution **80 (Rev.WRC-2000)**;

Reasons: To group various WRC agenda items of a similar nature and to avoid any misuse of the agenda.

6/1.12/15 Application of the provisions of RR No. 9.14

6/1.12/15.1 Background

It is considered that some of the Rules of Procedures on RR No. **9.14**, which have been in force for several years and without any difficulties mentioned either by the administrations or the Bureau, can be appropriately reflected in the body of the RR.

6/1.12/15.2 Summary of technical and regulatory studies

The Rule of Procedure on RR No. **9.14** specifies that "No. **9.14** applies to space-to-Earth frequency allocations only, i.e. coordination of a transmitting space station in respect of receiving terrestrial stations when the threshold value is exceeded. In the absence of threshold value, the provisions of No. **9.50.1** could apply (see also Appendix **5**)".

Considering that this Rule has not raised difficulties and can be translated in RR text, it is proposed to amend the wording of RR No. **9.14** to reflect the Rule of Procedure. Consequently, the Rules of Procedure on RR No. **9.14** related to this aspect should be suppressed.

6/1.12/15.3 Analysis of the results of studies

See § 6/1.12/15.2 above.

6/1.12/15.4 Methods to satisfy the agenda item

Below are example modifications to RR No. **9.14** to reflect the analysis above.

ARTICLE 9

Procedure for effecting coordination with or obtaining agreement of other administrations[1, 2, 3, 4, 5, 6, 7, 8] (WRC-03)

Section II – Procedure for effecting coordination[12, 13]

Sub-Section IIA – Requirement and request for coordination

MOD

9.14 *i)* for a <u>transmitting</u> space station of a satellite network for which the requirement to coordinate is included in a footnote to the Table of Frequency Allocations referring to this provision or to No. **9.11A** in respect of <u>receiving</u> stations of terrestrial services where the threshold value is exceeded; (WRC-0~~3~~<u>7</u>)

6/1.12/16 Provisions of RR Nos. 9.15 to 9.18

Since WRC-95, with the consideration and adoption of the report of the Voluntary Group of Experts (VGE), at various WRCs several attempts have been made to merge RR No. **9.15** into RR No. **9.17** and RR No. **9.16** into RR No. **9.18** due to the apparent similarity of these two pairs of provisions. In fact RR No. **9.15** and RR No. **9.16** stem from former Resolution **46 (WARC-92)** and RR No. **9.17** and RR No. **9.18** stem from former provisions **RR1107** and **RR1148** (Edition of 1990). However, after lengthy discussion, these different WRCs have recognized that the objectives and purposes of the two pairs mentioned above were entirely different.

The first pair (RR No. **9.15** and RR No. **9.16**) is dealing with:

RR No. **9.15:** the coordination of the *specifi*c earth station ***or typical*** earth station of a *non-geostationary-satellite network* for which the requirement to coordinate is included in a footnote to the Table of Frequency Allocations referring to RR No. **9.11A** in respect of terrestrial stations in frequency bands allocated with equal rights to space and terrestrial service and where the coordination area of the earth stations includes the territory of another country.

RR No. **9.16:** the coordination of a transmitting station of a terrestrial service for which the requirement to coordinate is included in a footnote to the Table of Frequency Allocations referring to RR No. **9.11A** and which is located within the coordination area of an earth station in a *non-geostationary-satellite network.*

The second pair (RR No. **9.17** and RR No. **9.18**) is dealing with:

RR No. **9.17**: the coordination of the *specifi*c earth station ***or typical*** *mobile* earth station in frequency band above 100 MHz allocated with equal rights to space and terrestrial services in respect of terrestrial stations ,where the coordination area of the earth stations includes the territory of another country with the exception of the coordination under RR No. **9.15,** and

RR No. **9.18:** the coordination of a transmitting station of a terrestrial service in the band referred to in RR No. **9.17** within the coordination area of an earth station, in respect of this earth station, with the exception of the coordination under RR No. **9.16**.

As it can be seen the wording and language used in these pairs of provisions are different in several areas since the purpose and objectives were different. In particular, RR No. **9.15** refers to typical earth stations whereas RR No. **9.17** refers to typical mobile earth stations, which is quite different from typical earth stations. On the other hand the first pair deals with earth stations in non-geostationary systems subject to RR No. **9.11A** whereas the second pair deals with earth stations in the general case with the exception of those referred to in the first pair.

The merging of these two pairs would thus cause unforeseeable difficulties. Incorporation/merging of provisions of RR No. **9.15** with RR No. **9.17** and provisions of RR No. **9.16** with RR No. **9.18** is not consistent with the letter and the spirit of the Radio Regulations. Such incorporation/merging does not simplify the application of these provisions and may create confusion for administrations in applying these provisions.

ITU-R has concluded that no change be made to these provisions.

6/1.12/17 Application of the provisions of RR No. 9.11A with respect to the category of services

6/1.12/17.1 Background

Some Rules of Procedure on RR No. **9.11A** have been in force for several years. In the spirit of RR Article **13**, ITU-R has studied the appropriateness or otherwise of transferring these Rules of Procedure to the RR. Two views were expressed in this regard, as stated below.

6/1.12/17.2 Summary of technical and regulatory studies

§ 1 of RR Appendix **5** stipulates that "For the purpose of effecting coordination under Article **9**, except in the case under No. **9.21**, and for identifying the administrations with which coordination is to be effected, the frequency assignments to be taken into account are those in the same frequency band as the planned assignment, pertaining to the same service or to another service to which the band is allocated with equal rights or a higher category of allocation, which might affect or be affected, as appropriate."

However, footnote 1 stipulates that "the coordination between an earth station and terrestrial stations under Nos. **9.15**, **9.16**, **9.17**, **9.18** and **9.19**, or between earth stations operating in opposite directions of transmission under **9.17A**, applies only to assignments in bands allocated with equal rights".

In addition, the Rules of Procedure on RR No. **9.11A** (see § 2.3) specify that "the Board concluded that the procedure is applicable to all other space and terrestrial services with respect to those satellite services having allocations with equal rights and mentioned in the specific footnotes to which this provision applies". These Rules have been in force since 2001 but, since 1992, the practice of the BR has been to examine coordination under RR Nos. **9.11A-9.14** between services with equal rights only (see Table 1 to RS46 Rule of Procedure (Edition 1994)). This discrepancy between the RR and the Rules of Procedure has been brought to the attention of WRC-03 under Agenda item 7.1, but, due to *inter alia* the lack of proposals from the Member States, the Conference did not consider the issue.

ITU-R, in considering the above-mentioned issue, came to the following two views:

View A

Some administrations are of the view that it is appropriate to transfer this aspect of the Rules of Procedure into the RR. While it may appear that coordination between primary and secondary services may provide an opportunity for administrations to agree on ways the secondary service can operate compatibly with the primary service, it is noted that there is no incentive for a secondary service to coordinate with a primary service, as no reciprocity is allowed and the provisions of RR Nos. **5.28** to **5.31** apply, regardless of the result of the coordination procedure. Any such discussions could take place on a bilateral basis between the administrations.

Based on the current principle of "allocated with equal rights or a higher category of allocation," new networks allocated on a secondary basis have to coordinate with networks allocated on a primary basis that are ahead of them, but not with networks behind them in the process. Further, coordination between stations with primary and secondary allocations may infer, or lead to confusion, of the status of the rights of the station with a secondary allocation.

These administrations are of the opinion that the RR should be modified to reflect that coordination under RR No. **9.11A** applies only between services allocated with equal rights.

View B

Some other administrations are of the view that the above-mentioned Rules of Procedure are deficient and should not be considered for transfer to the RR until they are reviewed by the Radio Regulations Board.

Reasons for View B:

> According to the regulatory provisions in force, a non-GSO system in a service to which a given frequency band is allocated either in the body of the Table of Frequency Allocations or in a footnote to that Table could be under one of the following provisions:
>
> a) Provisions of RR No. **9.11A**,
>
> b) Provisions of RR No. **22.2**,
>
> c) Provisions of "Non-interference and non-protection"; RR No. **4.4**.
>
> The application of RR No. **4.4** to the above-mentioned non-GSO system covers the cases in which the corresponding service is not allocated in RR Article **5**.
>
> If the above mentioned non-GSO system is referred to in any footnote of the Table of Frequency Allocations to which reference is made to RR No. **9.11A**, then RR No. **22.2** would no longer be applicable since the applications of RR No. **9.11A** and RR No. **22.2** are mutually exclusive.
>
> Now, if the procedure of RR No. **9.11A** only applied to services having allocation with equal status then the non-GSO secondary service would no longer be involved in the coordination procedure with any GSO primary service. This would result that the above-mentioned non-GSO system neither applies RR No. **9.11A** nor RR No. **22.2**. This means that the relation between the above-mentioned non-GSO system in a secondary service and any GSO network in a primary service would only be covered by RR Nos. **5.25**-**5.31**. In

other words, the factual relation between non-GSO and GSO systems which was governed by RR No. **22.2** now would be governed by RR No. **5.28** - RR No. **5.31**. However, there is a difference between RR No. **22.2** and RR No. **5.28** - RR No. **5.31**. The former deals with the term “unacceptable interference” and the latter deals with “harmful interference”. It is quite clear that GSO networks have a more realistic and factual protection under RR No. **22.2** than that under RR No. **5.28** - RR No. **5.31**.

Moreover, the sole obligation for the secondary service not to cause harmful interference to nor claim protection from the primary service is not sufficient to fulfill the required conditions without any supporting evidence that such obligations are observed in reality. In View A, it is mentioned that “there is no incentive for a secondary service to coordinate with a primary service, as no reciprocity is allowed and the provisions of RR Nos. **5.28** to **5.31** apply”. Although this may be correct, there is a real difference between incentive to apply a given provision of the RR and fulfill certain conditions and the obligation to apply those given provisions and meet certain conditions.

The transfer of the Rules of Procedure into the body of the RR, apart from injecting inconsistencies in the text of footnote 1 to RR Appendix **5** constitutionalizes the non-observance and the non-application of the very obligation of the secondary service and contributes to the degree of uncertainty for the primary service that there would be no guarantee or modality to ascertain the fulfillment of these obligations in real terms. Consequently, involvement of the secondary status in the process of coordination with the primary service is deemed as an evidence and supporting action to ensure the primary service that the conditions of not causing harmful interference.

These administrations therefore do not agree to the transfer of the Rules of Procedure into the RR. These Rules, although are currently inconsistent with the very principle of the RR, have been used by the Bureau and there is no need to give them a higher status than what they have, recognizing the fact that Rules of Procedure could be modified any time (between two WRCs which are currently scheduled every four years) and further recognizing that their transfer to the RR with those above-mentioned deficiencies may cause more confusion.

6/1.12/17.3 Analysis of the results of studies

See § 6/1.12/17.2 above.

6/1.12/17.4 Methods to satisfy the agenda item

Below is an example modification to RR Appendix **5** to reflect View A above.

APPENDIX 5 (Rev.WRC-0~~3~~7)

Identification of administrations with which coordination is to be effected or agreement sought under the provisions of Article 9

1 For the purpose of effecting coordination under Article **9**, except in the case under No. **9.21**, and for identifying the administrations with which coordination is to be effected, the frequency assignments to be taken into account are those in the same frequency band as the planned assignment, pertaining to the same service or to another service to which the band is allocated with equal rights or a higher category MOD [1] of allocation, which might affect or be affected, as appropriate, and which are:

MOD

[1] The coordination procedures~~between an earth station and terrestrial stations~~ under Nos. **9.11A** to~~**9.15**, **9.16**, **9.17**, **9.18** and~~ **9.19**~~, or between earth stations operating in opposite directions of transmission under **9.17A**,~~ apply~~ies~~ only to assignments to services~~in bands~~ allocated with equal rights.

Reasons for this proposed modification:

– to transfer the Rules of Procedure on RR No. **9.11A** to indicate that the provisions of RR No. **9.11A** (i.e. RR Nos. **9.11A** to **9.16**) apply only between services allocated with equal rights;

– the reference to "stations operating in opposite direction of transmission under RR No. **9.17A**" is not needed as the wording of RR No. **9.17A** is already explicit.

Under View B above, no change to the RR is required.

Agenda item 7.1[*]

"to consider and approve the Report of the Director of the Radiocommunication Bureau; on the activities of the Radiocommunication Sector since WRC-03; on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and on action in response to Resolution 80 (Rev.WRC-2000)"

6/7.1/1 Inconsistencies in Article 2A of each of RR Appendices 30 and 30A

6/7.1/1.1 Background

Article 2A of each of RR Appendices **30** and **30A** addresses the use of guardbands to provide space operation functions in accordance with RR No. **1.23** in support of the operations of geostationary-satellite networks in the broadcasting-satellite service (BSS) and the BSS feeder link respectively.

The regulatory deadline for bringing into use an assignment for space operation functions in the guardband supporting the BSS network is defined in Article 2A of each of RR Appendices **30** and **30A**, wherein direction is given to notify such assignments in accordance with RR Article **11**. However, the regulatory deadline for notification of the assignment is not clear because RR No. **11.44.1** refers to a maximum period of seven years from the date of receipt of the relevant advance publication information (API), but an API is not submitted for such BSS or BSS feeder-link assignments.

In addition, there currently exists no regulatory procedure to accommodate a new entry or modification to an assignment for the space operation functions in the guardband when the assignments of the supporting geostationary-satellite network in the BSS have already been brought into use. This situation can occur when there is a replacement BSS satellite that has the same characteristics as the notified network, with the exception of the assignments for space operation functions. Accordingly, a new regulatory procedure with an associated deadline is required to accommodate this situation.

6/7.1/1.2 Summary of technical and regulatory studies

Specific modifications to the text in Article 2A of each of RR Appendices **30** and **30A** have been considered to clarify the notification deadline for bringing into use an assignment for space operation functions in the guardband supporting the BSS network, and to accommodate a new entry or modification to an assignment for the space operation functions in the guardband when the assignments of the supporting geostationary-satellite network in the BSS have already been brought into use.

[*] Consideration of the status of ITU-R studies under Agenda item 7.1 is contained in Chapter 7 of the CPM Report.

6/7.1/1.3 Analysis of the results of studies

After reviewing the proposed modifications mentioned in § 6/7.1/1.2, it was considered that a more complete and comprehensive review of the entire text in Article 2A of each of RR Appendices **30** and **30A** would be appropriate to ensure that the situation is fully clarified, while at the same time ensuring that the original intent of the coordination and notification procedures that are the subject of Article 2A of each of RR Appendices **30** and **30A** is preserved.

6/7.1/1.4 Methods to satisfy the agenda item

Article 2A of each of RR Appendices **30** and **30A** could be modified with a view to reorganizing the sequencing of the provisions to improve the logical flow; clarifying the deadline for notification and bringing into use of assignments for space operation functions in the guardband supporting the BSS network; accommodating a new entry or modification to an assignment for the space operation functions in the guardband when the assignments of the supporting geostationary-satellite network in the BSS have already been brought into use; and preserving the original intent of the coordination and notification procedures that are the subject of this Article 2A.

A text that would reflect this course of action has yet to be developed by administrations and submitted to the Conference (WRC-07) if they so wish.

Annex 1

Consideration of a request for extension of the time-limit for bringing into use in RR Article 11

Under WRC-07 Agenda item 1.12, CPM-07 considered a document from one administration proposing the inclusion in RR Article **11** of limited and qualified provisions to extend the regulatory time-limit for bringing into use assignments to space stations of satellite networks. The first proposal would have the effect of aligning the regulatory conditions for extension of this time-limit due to specified launch delays/failures to those conditions applicable for the bands subject to RR Appendices **30** and **30A**. The second proposal addressed the issue of launch delay due to another satellite in co-passenger launch situations.

The administration stated specifically that it has full intention to bring into use the assignments of its satellite network within its regulatory time-limit. In particular, that administration noted that it has already submitted the associated Resolution **49 (Rev.WRC-03)** information for that network.

CPM-07 noted the concerns expressed by that administration regarding a potential launch delay or failure that may arise from circumstances that are entirely out of its control and noted that some exceptions to RR No. **11.44** had been granted by previous WRCs in specific cases where an administration had been unable to bring into use assignments to space stations within the applicable time-limit(s). The possibility therefore exists that WRC-07 consider this and other specific cases with a view to alleviating the very difficult situation faced by administrations in such critical situations, in particular for developing countries. CPM-07 also acknowledged that the decision at the 2006 Plenipotentiary Conference to expand the interval between WRCs could place the administration in a difficult situation because of having to wait at least three to four years after the deadline stipulated in RR No. **11.44**.

Given the option to address this particular matter at WRC-07 on a case-by-case basis, CPM-07 preferred this approach rather than proposing changes to the RR. CPM-07 expressed sympathy for a satisfactory resolution of the problem raised by that administration at WRC-07.

CPM-07 therefore recommended that the administration concerned, if it so wishes, bring its case to the attention of WRC-07 for appropriate action, inviting the Conference to give special consideration to the matter, taking into consideration Article 44 of the ITU Constitution, RR No. **0.3**, Resolution **80 (Rev.WRC-2000)** and any elements provided by that administration at WRC-07. The Radiocommunication Bureau is invited to take any appropriate action to facilitate the consideration of the matter by WRC-07.

Annex 2

Other issues regarding the application of RR No. 22.2 in the frequency band 1 467-1 492 MHz

CPM07-2 received two contributions (Documents CPM07-2/79 and 36) relating to the use of WRC-07 agenda item 1.12 to suppress the application of RR No. **22.2** in the frequency band 1 467-1 492 MHz for the broadcasting-satellite service and its “replacement” with a coordination procedure under RR No. **9.11A**. These contributions considered that such proposal goes beyond the regulatory and procedural aspects envisaged for this agenda item, whose purpose is not to address cases of specific allocations. These documents conclude that this issue may not be addressed under any WRC-07 agenda item.

Document CPM07-2/79 also stated that the introduction of a coordination procedure in the frequency band 1 452-1 492 MHz between NGSO systems and GSO networks according to RR No. **9.11A** in “substitution” for the application of RR No. **22.2** would effectively modify the very nature of that allocation and that no such studies were undertaken beyond those elements that have already led WRC-03 to decide in favour of the retention of RR No. **22.2**.

In addition, in Document CPM07-2/36, it is highlighted that there is a major difference between the scope of application of RR No. **22.2** and that of RR No. **9.11A**, in that RR No. **22.2** refers to the term “unacceptable interference” whereas the result of the application of RR No. **9.11A**, in case of no reply, would be that the GSO network should not cause harmful interference to nor claim protection from the NGSO system.

CPM07-2 also reviewed the report of the Special Committee to CPM07-2, which indicates that many administrations considered that the above-mentioned proposal encompasses technical and allocation aspects which go beyond regulatory and procedural matters and cannot be considered under Agenda item 1.12 while a few administrations considered that this issue falls within WRC-07 Agenda item 1.12. As a result, the Special Committee could not agree on the appropriateness of reviewing such proposal under WRC-07 Agenda item 1.12.

In considering the above contributions, CPM07-2 concluded that this issue may be considered by WRC-07.

CHAPTER 7

FUTURE WRC WORK PROGRAMMES AND OTHER ISSUES

(Agenda items 2, 4, 5, 6, 7.1 and 7.2)

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Agenda item 2

"to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution 28 (Rev.WRC-03), and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with principles contained in the Annex to Resolution 27 (Rev.WRC-03)"

Resolution 27 (Rev.WRC-03) – Use of incorporation by reference in the Radio Regulations

Resolution 28 (Rev.WRC-03) – Revision of references to the text of ITU-R Recommendations incorporated by reference in the Radio Regulations

7/2/1 Incorporation by reference of ITU-R Recommendations mentioned in Volumes 1 and 2 of the Radio Regulations – Changes to provisions of a non-mandatory nature

It was noted that references to ITU-R Recommendations of non-mandatory character do not need to be updated by a WRC.

It was noted that Resolutions **27 (Rev.WRC-03)** and **28 (Rev.WRC-03)** do not contain a procedure for updating the references to ITU-R Recommendations of non-mandatory character.

WRC-07 may wish to consider the need to establish such a procedure and to adopt the necessary texts as appropriate.

The various footnotes and provisions in the RR were examined by the Special Committee, from the point of view of incorporation by reference and were submitted to the CPM. The CPM preferred not to study them and are sent to WRC-07 for information.

MOD

5.208A In making assignments to space stations in the mobile-satellite service in the bands 137-138 MHz, 387-390 MHz and 400.15-401 MHz, administrations shall take all practicable steps to protect the radio astronomy service in the bands 150.05-153 MHz, 322-328.6 MHz, 406.1-410 MHz and 608-614 MHz from harmful interference from unwanted emissions. The threshold levels of interference detrimental to the radio astronomy service are shown in Table 1 of Recommendation ITU-R RA.769~~-1~~. (WRC-~~9~~07)

Reasons: To conform to Resolution **27 (Rev.WRC-03)** (Annex 2, § 5), as the language indicates this Recommendation is not mandatory and it is not in RR Volume 4.

Regarding No. **5.536A**, two options were identified:

Option 1:

MOD

5.536A Administrations operating earth stations in the Earth exploration-satellite service or the space research service shall not claim protection from stations in the fixed and mobile services operated by other administrations. In addition, earth stations in the Earth exploration-satellite service or in the space research service should be operated taking into account the most recent versions of Recommendations ITU-R SA.1278 and ITU-R SA.1625, respectively. (WRC-0~~3~~7)

Reasons: To conform to Resolution **27 (Rev.WRC-03)** (Annex 2, § 5), as the “should” language indicates this Recommendation is not mandatory and is not in RR Volume 4.

Option 2:

NOC

5.536A

Reasons: The use of the terminology “the most recent version of” could be regarded as discretionary in accordance with Annex 2 to Resolution **27 (Rev.WRC-03)**.

NOTE – In the following situations, it is suggested to refer to “the most recent version of” an ITU-R Recommendation, recognizing that in these situations, this reference is of a non-mandatory nature.

MOD

47.26 § 8 1) The holder of a radiocommunication general operator’s certificate or a first- or second-class radiotelegraph operator’s certificate shall be authorized to embark as chief operator of a ship station of the fourth category (which is described in the most recent version of Recommendation ITU-R M.1169). (WRC-0~~3~~7)

Reasons: To conform to Resolution **27 (Rev.WRC-03)** (Annex 2, § 5), as the Recommendation is for information only in this context.

MOD

47.27 2) However, before becoming chief or sole operator of a ship station of the fourth category (in accordance with the most recent version of Recommendation ITU-R M.1169) which is required by international agreements to carry a radiotelegraph operator, the holder of a radiocommunication general operator’s certificate or a first- or second-class radiotelegraph operator’s certificate shall have had adequate experience as operator on board ship at sea. (WRC-0~~3~~7)

Reasons: To conform to Resolution **27 (Rev.WRC-03)** (Annex 2, § 5), as the Recommendation is for information only in this context.

MOD

47.28 3) Before becoming chief operator of a ship station of the second or third category (in accordance with the most recent version of Recommendation ITU-R M.1169), the holder of a radiocommunication general operator's certificate or a first- or second-class radiotelegraph operator's certificate shall have had, as operator on board ship or in a coast station, at least six months' experience of which at least three months shall have been on board ship. (WRC-0~~3~~7)

Reasons: To conform to Resolution **27 (Rev.WRC-03)** (Annex 2, § 5), as the Recommendation is for information only in this context.

MOD

47.29 4) Before becoming chief operator of a ship station of the first category (in accordance with the most recent version of Recommendation ITU-R M.1169), the holder of a radiocommunication general operator's certificate or a first-class radiotelegraph operator's certificate shall have had, as operator on board ship or in a coast station, at least one year's experience of which at least six months shall have been on board ship. (WRC-0~~3~~7)

Reasons: To conform to Resolution **27 (Rev.WRC-03)** (Annex 2, § 5), as the Recommendation is for information only in this context.

7/2/2 Incorporation by reference of ITU-R Recommendations mentioned in WRC Resolutions

If a WRC Resolution includes a *resolves* referring to an ITU-R Recommendation or portion thereof in a specific manner (by number and version) using mandatory language (i.e. shall), the ITU-R Recommendation or parts thereof are considered to be incorporated by reference.

There are cases where these ITU-R Recommendations are not contained in RR Volume 4. Table 2-1 is a non-exhaustive list of cases where an ITU-R Recommendation is referenced using mandatory language (i.e. shall) in a WRC Resolution, which have been analysed to determine whether the Recommendations are incorporated by reference.

In order to clarify the scope of incorporation by reference and confirm the treatment of those ITU-R Recommendations, Resolution **27 (Rev.WRC-03)** should be modified in the following way.

Example of draft modifications of Resolution **27 (Rev.WRC-03)**

MOD

ANNEX 1 TO RESOLUTION 27 (Rev.WRC-03)

Principles of incorporation by reference

1 For the purposes of the Radio Regulations, the term "incorporation by reference" shall apply only to those references intended to be mandatory.

2 Where the relevant texts are brief, the referenced material should be placed in the body of the Radio Regulations rather than using incorporation by reference.

2*bis* Where a reference to an ITU-R Recommendation, or parts thereof, is included in the *resolves* of a WRC Resolution, which is itself cited in a footnote or provision of the Radio Regulations using mandatory language (i.e. shall), that ITU-R Recommendation or parts thereof, shall also be considered for incorporation by reference,

3 Texts which are of a non-mandatory nature or which refer to other texts of a non-mandatory nature shall not be considered for incorporation by reference.

4 If, on a case-by-case basis, it is decided to incorporate material by reference on a mandatory basis, then the following provisions shall apply:

4.1 the text incorporated by reference shall have the same treaty status as the Radio Regulations themselves;

4.2 the reference must be explicit, specifying the specific part of the text (if appropriate) and the version or issue number;

4.3 the text incorporated by reference must be submitted for adoption by a competent WRC in accordance with *resolves* 3;

4.4 all texts incorporated by reference shall be published following a WRC, in accordance with *resolves* 4.

5 If, between WRCs, a text incorporated by reference (e.g. an ITU-R Recommendation) is updated, the reference in the Radio Regulations shall continue to apply to the earlier version incorporated by reference until such time as a competent WRC agrees to incorporate the new version. The mechanism for considering such a step is given in Resolution **28 (Rev.WRC-03)**.

TABLE 2-1

A non-exhaustive list of cases where a WRC Resolution having mandatory effects includes a *resolves* referring to an ITU-R Recommendation or parts thereof using mandatory language

Radio Regulations	Resolution			Interpretation
	No.	**Title**	***Resolves***	
No. **5.446A**	**229 (WRC-03)**	Use of the bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz by the mobile service for the implementation of wireless access systems including radio local area networks	8 that, in the bands 5 250-5 350 MHz and 5 470-5 725 MHz, the mitigation measures found in **Annex 1 to Recommendation ITU-R M.1652** shall be implemented by systems in the mobile service to ensure compatible operation with radiodetermination systems	Mandatory **Reasons**: The use of the term “shall” in the *resolves* of the Resolution
No. **5.328A**	**609 (WRC-03)**	Protection of aeronautical radionavigation service systems from the equivalent power flux-density produced by radionavigation-satellite service networks and systems in the 1 164-1 215 MHz frequency band	10 that the methodology and the reference worst-case ARNS system antenna contained in **Recommendation ITU-R M.1642** shall be used by administrations for calculating the aggregate epfd produced by all the space stations within all RNSS systems in the band 1 164-1 215 MHz	
No. **5.443B***	**741 (WRC-03)**	Protection of the radio astronomy service in the band 4 990-5 000 MHz from unwanted emissions of the radionavigation-satellite service (space-to-Earth) operating in the frequency band 5 010-5 030 MHz	2 that in order not to cause harmful interference to the RAS in the band 4 990-5 000 MHz, over the whole sky, for elevations higher than the minimum operating elevation angle Θ_{min} specified for the radio telescope, the epfd produced in this band by all space stations within any non-GSO RNSS system operating in the 5 010-5 030 MHz band shall not exceed –245 dB(W/m^2) in a 10 MHz band at any radio astronomy station for more than 2% of the time, using the methodology in **Recommendation ITU-R M.1583** and a reference antenna with a radiation pattern and maximum antenna gain given in **Recommendation ITU-R RA.1631**	

NOTE – Recommendations ITU-R M.1652, ITU-R M.1642 and ITU-R M.1583 are not included in the latest version of RR Volume 4. As some of these Recommendations have been updated since WRC-03, if WRC-07 agrees to incorporate them by reference, WRC-07 will need to consider whether or not to update the corresponding references in the RR.

* The Administrations of Algeria, Saudi Arabia, Bahrain, Djibouti, Egypt, United Arab Emirates, Jordan, Kuwait, Lebanon, Morocco, Mauritania, Oman, Qatar, Syrian Arab Republic and Tunisia <u>object</u> to the consideration of Recommendations ITU-R M.1583 and ITU-R RA.1631 as mandatory.

7/2/3 ITU-R Recommendations incorporated by reference in the RR which have been revised and approved since WRC-03

The list of those ITU-R Recommendations incorporated by reference in the RR (Resolution **27 (Rev.WRC-03))** which have been revised and approved during the elapsed study period since WRC-03 is shown below.

– Recommendation ITU-R M.541-8 – Operational procedures for the use of digital selective-calling equipment in the maritime mobile service;
– Recommendation ITU-R P.838-2 – Specific attenuation model for rain for use in prediction methods;
– Recommendation ITU-R M.1174-1 – Technical characteristics of equipment used for on-board vessel communications in the bands between 450 and 470 MHz;
– Recommendation ITU-R M.1187 – A method for the calculation of the potentially affected region for a mobile-satellite service network in the 1-3 GHz range using circular orbits;
– Recommendation ITU-R BO.1443-1 – Reference BSS earth station antenna patterns for use in interference assessment involving non-GSO satellites in frequency bands covered by RR Appendix **30**;
– Recommendation ITU-R S.1586 – Calculation of unwanted emission levels produced by a non-geostationary fixed-satellite service system at radio astronomy sites.

The CPM also noted that, in some cases, different texts of the RR make reference to different versions of ITU-R Recommendations (see, for instance, No. **22.5C.6** which makes reference to Recommendation ITU-R S.1428-1, which is included in RR Volume 4, and Annex 1 to Resolution **76 (WRC-2000)** which makes reference to Recommendation ITU-R S.1428). The CPM considers that WRC-07, under Agenda item 2, should also review the references to the ITU-R Recommendations incorporated by reference which are referred in other texts (such as Annex 1 to Resolution **76 (WRC-2000)**) and amend them accordingly, as part of the consequential changes envisaged by Agenda item 3 of the Conference.

7/2/4 List of RR provisions and footnotes containing references to ITU R Recommendations

According to Resolution **27 (Rev.WRC-03)**, the CPM took note of a list of the RR provisions and footnotes containing references to ITU-R Recommendations. This list is provided in Table 2-2.

TABLE 2-2

List of RR provisions and footnotes
containing references to ITU-R Recommendations

	Recommendation ITU-R	
RR provisions or footnotes	**Number***	**Included in RR Volume 4**
1.14	**TF.460-6**	**YES**
5.208A	RA.769-1	NO
5.279[a]	**SA.1260-1**	**YES**
5.287	M.1174	NO
5.288	**M.1174-1**	**YES**
5.328A (via Res. **609 (WRC-03)**)	M.1642**	NO
5.391	**SA.1154**	**YES**
5.443B (via Res. **741 (WRC-03)**)	M.1583** **RA.1631**	NO **YES**
5.446A (via Res. **229 (WRC-03)**)	M.1652**	NO
5.447E	**F.1613**	**YES**
5.447F	**M.1638,** **SA.1632**	**YES** **YES**
5.450A	**M.1638**	**YES**
5.504B	**M.1643**	**YES**
5.504C	**M.1643**	**YES**
5.508A	**M.1643**	**YES**
5.509A	**M.1643**	**YES**
5.511A	**S.1341**	**YES**
5.511C	**S.1340**	**YES**
5.536A	SA.1278, SA.1625	NO NO
5.543A	RA.769	NO
5.551H	**S.1586,** **RA.1631**	**YES** **YES**
16.2	SM.1139	NO
16.6	SM.1139	NO
19.38	**M.257-3**	**YES**
19.48	**M.1172**	**YES**
19.83	**M.257-3,** **M.476-5,** **M.625-3,** **M.627-1**	**YES** **YES** **YES** **YES**
19.92	**M.257-3**	**YES**
19.96A	**M.257-3,** **M.476-5**	**YES** **YES**

TABLE 2-2 (*continued*)

RR provisions or footnotes	Recommendation ITU-R	
	Number*	**Included in RR Volume 4**
19.112	M.585	NO
21.2.2	SF.765	NO
21.4.1	SF.765	NO
22.5A	**S.1256**	**YES**
TABLE **22-1A** (and **22.5C.6**)	**S.1428-1**	**YES**
TABLE **22-1B** (and **22.5C.6**)	**S.1428-1**	**YES**
TABLE **22-1C** (and **22.5C.6**)	**S.1428-1**	**YES**
TABLE **22-1D** (and **22.5C.11**)	**BO.1443-1**	**YES**
TABLE **22-2** (and **22.5D.3**)	**S.672-4**	**YES**
TABLE **22-3** (and **22.5F.3**)	**S.672-4**	**YES**
22.36	S.732	NO
25.6	M.1544	NO
29.12	RA.769	NO
32.7	**M.1172**	**YES**
47.26	**M.1169**	**YES**
47.27	**M.1169**	**YES**
47.28	**M.1169**	**YES**
47.29	**M.1169**	**YES**
50.9	**M.1169**	**YES**
51.35	**M.541-8**	**YES**
51.41	**M.476-5,** **M.625-3,** **M.627-1**	**YES** **YES** **YES**
51.71	**M.1171**, M.1170	**YES** NO
51.77	**M.489-2**	**YES**
52.23	M.1170	NO
52.25	M.1170	NO
52.27	**M.492-6**	**YES**
52.31	M.1170	NO
52.32	M.1170	NO
52.63	M.1170	NO
52.69	M.1170	NO
52.148	**M.541-8**	**YES**
52.149	**M.541-8**	**YES**
52.152	**M.541-8**	**YES**

TABLE 2-2 (*continued*)

RR provisions or footnotes	**Recommendation ITU-R**	
	Number*	**Included in RR Volume 4**
52.153	**M.541-8**	**YES**
52.159	**M.541-8**	**YES**
52.181	**M.1173**	**YES**
52.188	**M.257-3**	**YES**
52.192	**M.1171**	**YES**
52.195	**M.1171**	**YES**
52.213	**M.1171**	**YES**
52.222.1	**M.257-3**	**YES**
52.224	**M.1171**	**YES**
52.229	**M.1173**	**YES**
52.231	**M.489-2**	**YES**
52.234	**M.1171**	**YES**
52.235	**M.257-3**	**YES**
52.240	**M.1171**	**YES**
54.2	**M.257-3,** M.493-9 **M.541-8,** M.821-1, M.825-2	**YES** NO **YES** NO NO
55.1	M.1170	NO
56.2	**M.492-6**	**YES**
57.1	**M.1171**	**YES**
Appendix **1** (§ 1 and § 2)	**SM.1138**	**YES**
Appendix **3**		
§ 4	SM.329	NO
§ 10	M.1177	NO
§ 10*bis*	SM.329, M.1177	NO NO
Annex 1 (§ 1 and § 3)	SM.1541	NO
Appendix **4**		
Annex 2	S.1503, SM.1413	NO NO
Annex 2, Footnotes to Tables **A**, **B**, **C**, **D**	SF.675	NO
Annex 2, item **B.4.b.1.a**	SM.1413	NO
Annex 2, item **B.4.b.1.b**	SM.1413	NO
Annex 2, item **C.11.b**	**M.1187**	**YES**

TABLE 2-2 (*continued*)

	Recommendation ITU-R	
RR provisions or footnotes	**Number***	**Included in RR Volume 4**
Appendix **5**, Annex 1	IS.1143 (now M.1143), SF.357	NO NO
Appendix **7**, Annexes 4, 5, 6	SM.1448	NO
Appendix **13**		
Part A1, § 5	**M.1172**	**YES**
Part A2, § 10	**M.489-2**	**YES**
Part A2, § 14A	**M.1171**	**YES**
Part A5, § 1	**M.690-1**	**YES**
Part A5, § 4	**M.690-1**	**YES**
Part A5, § 9	**M.1175**	**YES**
Part A5, § 11	**M.257-3**	**YES**
Appendix **15**, Table 15-2	**M.690-1**	**YES**
Appendix **17**, Part B	**M.1173**	**YES**
Appendix **18**, Notes referring to the Table	M.1084-2 **M.489-2**	NO **YES**
Appendix **30**		
Article 11, Col. 6	BO.1445	NO
Article 11, Col. 9	BO.1213	NO
Annex 3, § 2.4.1	BO.1213	NO
Annex 5, § 2.1	P.837-1, P.618-5	NO NO
Annex 5, § 3.1.1	F.405-1	NO
Annex 5, § 3.2.4	BO.1212	NO
Annex 5, § 3.4	**BO.1293-2,** BO.1297	**YES** NO
Annex 5, § 3.7.2	BO.1213	NO
Annex 5, § 3.13.3	BO.1445	NO
Annex 6, Part A, § 1.1	BO.1213, S.580-5	NO NO
Annex 6, Part B, § 1.5	S.483-3	NO
Annex 6, Part B, § 2.1	S.465-5	NO
Appendix **30A**		
Article 9A, Col. 6	BO.1296	NO
Article 9A, Col. 9	BO.1295	NO
Annex 3, § 2.1	P.837-1	NO

TABLE 2-2 (*end*)

RR provisions or footnotes	Recommendation ITU-R Number*	Included in RR Volume 4
Annex 3, § 2.2	P.618-5, **P.838-2,** P.841	NO **YES** NO
Annex 3, § 2.4	P.618-5	NO
Annex 3, § 3.3	BO.1297, **BO.1293-2**	NO **YES**
Annex 3, § 3.5.3	BO.1295	NO
Annex 3, § 3.7.3	BO.1296	NO
Annex 3, § 3.9	BO.1212	NO

* Numbers in bold indicate that these Recommendations are incorporated by reference.

** This Recommendation is not included in RR Volume 4 (see § 7/2/2)

Agenda item 4

"in accordance with Resolution 95 (Rev.WRC-03), to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation"

Resolution 95 (Rev.WRC-03) – General review of the Resolutions and Recommendations of world administrative radio conferences and world radiocommunication conferences

In response to Resolution **95 (Rev.WRC-03)**, the Bureau performed an initial study in this respect with consultation as appropriate with the Chairmen and Vice-Chairmen of Study Groups, and the results were submitted to RAG, for advice (see Document RAG07-1/1). The same results were presented to CPM. The CPM received additional contributions from membership. Annex 4-1 contains comments indicated in some input documents on WARC/WRC Resolutions and Recommendations.

The CPM wishes to emphasize that the indications in the column Comments should not be considered as proposals for the work of the Conference, but they are merely comments on a possible course of action that might be taken in respect of the concerned Resolutions and Recommendations which may facilitate the task of administrations in preparing their proposals for the work of the Conference.

The CPM refrained from commenting on a course of action in respect to those Resolutions and Recommendations that are explicitly on the agenda of WRC-07 and are shown in the table of Annex 4-1 as shaded.

Annex 4-1

Comments on WARC/WRC Resolutions and Recommendations in response to Resolution 95 (Rev.WRC-03)

Res. No.	Subject	Remark	Comments
Resolutions			
1	Notification of frequency assignments	Still relevant.	NOC
2	Equitable use of GSO and frequency bands for space services	Still relevant; text recently updated (at WRC-03).	NOC
4	Period of validity of GSO space systems	Still relevant; text recently updated (at WRC-03). For consideration by a future WRC. This subject may be considered in the context of Agenda items 1.10 and 1.12.	NOC
5	Technical cooperation – Propagation in tropical areas	Still relevant; text recently updated (at WRC-03). Supported by ITU-R studies.	NOC
7	National radio-frequency management	Still relevant; text recently updated (at WRC-03). Supported by BR and ITU-R studies with respect to spectrum management systems for developing countries; also supported by BR world and regional seminars.	NOC
10	Wireless communications by the International Red Cross and Red Crescent Movement	Still relevant.	NOC
13	Formation of call signs	Still relevant, no major problems experienced (**Separate BR Report to WRC-07**).	NOC
15	Cooperation in space radiocommunications	Still relevant; text recently updated (at WRC-03). Implemented through liaison with ITU-D Study Groups and BR/BDT seminars.	NOC
18	Identification/non-parties in an armed conflict	Still relevant; may need to be modified if WRC-07 decides to suppress Appendix **13** under Agenda item 1.14.	NOC MOD
20	Technical cooperation – Aeronautical service	Still relevant; text recently updated (at WRC-03).	NOC

Res. No.	Subject	Remark	Comments
		Resolutions	
21	Transfer of HF-FX in 2007	Would become obsolete after the completion of the transition period (1 April 2007) This Resolution is referred to in ~~RR~~ Nos. **5.136**, **5.143**, **5.146** and **5.151**.	SUP
25	Operation of Global Satellite Systems for personnel communications	Still relevant; text recently updated (at WRC-03).	NOC
26	Review of footnotes	Still relevant (permanent agenda item at each WRC). Some updates may be required (e.g. in *further resolves* 3).	–
27	Incorporation by reference/principles	Still relevant (permanent agenda item at each WRC).	–
28	Revision of references to ITU-R Recommendations	Still relevant; linked with Resolution **27**. **Report by RA-07 to WRC-07 Agenda item 2**.	–
33	Procedure for BSS prior to the entry into force of agreements and plans for the BSS	Processing of filings under this Resolution completed. This Resolution is referred to in ~~RR~~ No. **5.311** (footnote that may be reviewed under Agenda item 1.11). A former version of this Resolution is referred to in No. **5.396**.	SUP
		Processing of filings under this Resolution has not been completed.	NOC
34	Planning the band 12.5-12.75 GHz in R3	Still relevant. Text may need to be updated in view of WRC-07 decision on Resolution **33**.	NOC
		The provisions of Resolution **34 (Rev.WRC-03)** could be included in the main body of the Radio Regulations by modifying Table **21-4** of Article **21**.	SUP
42	Interim systems in R2 (BSS and FSS) in AP30/30A bands	Still relevant; text recently updated (at WRC-03).	NOC
49	Administrative due diligence	Still relevant.	NOC
51	Transitional arrangements concerning coordination and notification	Transitional arrangement implemented by the time of WRC-07.	SUP
55	Temporary procedures for improving satellite network coordination and notification procedure.	Still relevant. May need to be updated.	MOD
56	Early application of No. **9.2**, as revised by WRC-03	Obsolete as from 1 January 2005.	SUP

Res. No.	Subject	Remark	Comments
		Resolutions	
57	Special arrangements for the networks above 71 GHz	Implemented. May be deleted. SC has concluded WRC-07 may consider suppression of this Resolution.	SUP
		If the Resolution is retained for historical purposes, WRC-07 will need to review its provisions so as to take account of the decisions of WRC-03 to suppress the extension previously provided for in No. **11.44**	MOD
58	Transitional measures for coordination in the bands 10.7-12.75 GHz, 17.8-18.6 GHz and 19.7-20.2 GHz	Still relevant. May need to be updated in view of current developments within BR leading to the completion of the "epfd" simulation software package.	MOD
63	Protection from ISM equipment	Still relevant; text recently updated (at WRC-03). ITU-R studies are ongoing.	NOC
72	Regional preparations	Superfluous. Some actions are completed, others included in other texts (Resolution 80 (PP-02), Resolution 25 (PP-02)).	MOD
73	Compatibility BSS-R1/FSS-R3 in 12 GHz	Still relevant.	NOC
74	Continuing updating of technical bases of Appendix **7**	Still relevant. Permanent agenda item for each WRC; included in Agenda item 7.1 of WRC-07. Ongoing consideration in SGs 1 and 3.	NOC
75	Possible update of technical bases of Appendix **7** for determining coordination area of receiving ES in SRS in bands 31.8-32.3 and 37-38 GHz	Still relevant (ITU-R studies are ongoing). Closely related to Resolution **74**. This Resolution is referred to in ~~RR~~ No. **5.547**.	NOC
76	Development of calculation methodologies concerning aggregate epfd produced by non-GSO in the bands 10.7-30 GHz	*Resolves* part still relevant. Invites ITU-R may need to be updated taking account of Recommendation ITU-R S.1588 in force.	MOD
79	Criteria for determining coordination distances to protect RA stations from HDFS in band 42.5-43.5 GHz	Still relevant (ongoing studies on methodology provided in Recommendation ITU-R F.1766 (approved 2006). This Resolution is referred to in ~~RR~~ No. **5.547**.	NOC
80	Principles of the Constitution, to be taken into consideration	For consideration by WRC-07 Agenda item 7.1. **BR Report to WRC-07.**	–
81	Evaluation of administrative due diligence	Still relevant; may need to be updated.	MOD

Res. No.	Subject	Remark	Comments
Resolutions			
85	Protection of GSO systems (FSS and BSS) from non-GSO FSS systems	Still relevant. May need to be updated in view of current developments within BR leading to the completion of the "epfd" simulation software package.	MOD
86	Criteria for implementation of Res. 86 (Rev. PP-02)	For consideration by WRC-07 Agenda item 1.12. **BR Report to WRC-07.**	–
87	Entry into force of certain provisions relating to non-payment of cost-recovery fees	Implemented.	SUP
88	Rationalization of Articles 9 and 11 of the RR	For consideration by WRC-07 Agenda item 1.12.	–
89	Backlog in satellite filings	Still relevant. Implicitly on WRC-07 Agenda item 1.12. Recommendation ITU-R S.1656 in force; ITU-R studies are ongoing.	NOC
95	Review of Resolution/Recommendation	Still relevant (permanent agenda item at each WRC).	–
96	Provisional application of certain provisions of RR revised by WRC-03 and abrogation of certain Res./Rec.	Implemented and could be deleted.	SUP
105	Improvements in AP30B	Implicitly on the WRC-07 Agenda item 1.10. Some parts (e.g. concerning 26 dB *C/I*) in contradiction with WRC-03 decisions.	–
111	Planning of the FSS in 18/20/30 GHz	Still relevant.	NOC
114	FSS (feeder links for MSS) in 5 GHz	Still relevant; text recently updated (at WRC-03). Issue on the preliminary agenda for WRC-10, Item 3.1, as per RS803. Recommendation ITU-R S.1342 in force. This Resolution is referred to in ~~RR~~ Nos. **5.444** and **5.444A**.	NOC
122	HAPS in 47/48 GHz	For consideration by WRC-07 Agenda item 1.8. Modifications to Resolution under consideration in WP 4-9S. The former version of this Resolution is referred to in No. **5.552A**.	–

Res. No.	Subject	Remark	Comments
Resolutions			
124	Sharing FX/EESS in 8 GHz	Recommendation ITU-R F.1502 contains pfd limits different from those referred to in ~~RR~~ No. **5.462A**. Future WRC to review No. **5.462A**. ITU-R studies are ongoing on use of the band for EESS. This Resolution is referred to in No. **5.462A**.	NOC/ SUP (after the review of No. **5.462A**)
125	Sharing MSS/RA in 1.6 GHz	Ongoing studies, future WRC to review. ITU-R studies are ongoing (revision to Recommendation ITU-R SM.1633 or draft new Recommendation). This Resolution contains outdated reference to Recommendation ITU-R RA.769 (should be ITU-R 769-2).	NOC
132	FSS in 18/28 GHz	Implemented. May be considered for deletion.	SUP
136	Criteria for sharing between GSO FSS and non-GSO FSS in 37.5-50.2 GHz	Still relevant; text recently updated (at WRC-03). Issue on the preliminary agenda for WRC-10, Item 2.5. Recommendation ITU-R S.1655 in force.	NOC
139	Use of FSS for provision of DTH television broadcasting	Still relevant. Studies asked for consideration at WRC-03. The dates within the Resolution need to be modified.	MOD
140	Equivalent epfd limits in 19.7-20.2 GHz	Still relevant. Recommendation ITU-R S.1715 in force.	NOC
141	Sharing between NGSO/FSS systems and fixed service in 17.7-19.7 GHz	For consideration by WRC-07 Agenda item 1.18.	–
142	Transitional arrangements for use of the band 11.7-12.2 GHz by GSO/FSS networks in Region 2	Resolves 1, 2 and 4 implemented; *resolves* 3 still relevant.	MOD
143	Guidelines for implementation of high-density applications in the FSS in identified frequency bands	Still relevant. ITU-R studies are ongoing. This Resolution is referred to in ~~RR~~ No. **5.516B**.	NOC
144	Special requirements for operating earth stations in the FSS in the band 13.75-14 GHz	Parts still relevant (e.g. *resolves* 2). Recommendation ITU-R S.1712 in force.	MOD
145	Potential use of the bands 27.5-28.35 GHz and 31-31.3 GHz by HAPS in the fixed service	For consideration by WRC-07 Agenda item 1.8. Additional details in the **BR Report of activities** (no system published so far). This Resolution is referred to in ~~RR~~ Nos. **5.537A** and **5.543A**.	–

Res. No.	Subject	Remark	Comments
Resolutions			
146	Transitional arrangements for the application of the modified provisions of AP30B	Implemented. Implicitly on the WRC-07 agenda (Item 1.10).	–
205	Protection of MSS in 406-406.1 MHz	Still relevant (additional details in the **BR Report of activities**).	NOC
207	Monitor MMS/AM(R)S	Still relevant; text recently updated (at WRC-03). Monitoring reports regularly posted on the ITU website. Additional details in the **BR Report of activities**.	NOC
		Possibly revise in accordance with Agenda item 1.14.	MOD
212	Implementation of IMT-2000	Many elements implemented. Other issues for consideration by WRC-07 (Agenda item 1.4). This Resolution is referred to in ~~RR~~ Nos. **5.351A** and **5.388**.	–
215	Coordination among non-GSO MSS	Some elements are still relevant; ITU-R studies are ongoing.	MOD
217	Wind profiler radars	Still relevant. ITU-R studies are ongoing. This Resolution is referred to in ~~RR~~ Nos. **5.162A** and **5.291A**.	NOC
221	HAPS for IMT-2000 in the bands around 2 GHz	Still relevant, text recently updated (at WRC-03). This Resolution is referred to in ~~RR~~ No. **5.388A**.	NOC
222	Use of the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz by the MSS	Still relevant (on the preliminary agenda for WRC-10, Item 2.3). This Resolution is referred to in ~~RR~~ Nos. **5.353A** and **5.357A**.	NOC
223	Additional bands identified for IMT-2000	Some elements are still relevant, ongoing studies. The subject matter is under consideration by WRC-07 (Agenda item 1.4). This Resolution is referred to in ~~RR~~ Nos **5.384A** and **5.388**.	–
224	Frequency bands for the terrestrial component of IMT-2000 below 1 GHz.	Some elements are still relevant, ongoing studies. The subject matter is under consideration by WRC-07 (Agenda item 1.4). This Resolution is referred to in ~~RR~~ No. **5.317A**.	–

Res. No.	Subject	Remark	Comments
		Resolutions	
225	Use of additional bands for the satellite component of IMT-2000	Still relevant. Results of the studies to be reported to a future WRC. The subject matter is under consideration by WRC-07 (Agenda item 1.4). A former version of this Resolution is referred to in ~~RR~~ No. **5.348C**.	–
228	Further development of IMT-2000 and systems beyond IMT-2000	For consideration by WRC-07 Agenda item 1.4.	–
229	Use of bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz for WAS including RLAN	Still relevant. Recommendations ITU-R M.1739, ITU-R RS.1166-3 and ITU-R S.1427-1 in force. ITU-R studies are ongoing. This Resolution is referred to in ~~RR~~ Nos. **5.446A**, **5.447** and **5.453**.	NOC
230	Mobile allocations for wideband aeronautical telemetry and associated telecommand	For consideration by WRC-07 Agenda item 1.5.	–
331	Transition arrangements for the GMDSS	For consideration by WRC-07 Agenda item 1.14. A former version of this Resolution is referred to in ~~RR~~ No. **5.82**.	–
339	Coordination of NAVTEX	Still relevant; text recently updated (at WRC-03). A former version of this Resolution is referred to in ~~RR~~ No. **5.79A**.	NOC
		Revise to remove instruction to publish in the List of Coast Stations.	MOD
340	Additional SAR information	Largely implemented by ITU, although some elements (e.g. in the *invites* part) are still relevant.	MOD
342	Revision of AP18	For consideration by WRC-07 Agenda item 1.14.	–
343	Certificates (vessels using GMDSS equipment on a non-compulsory basis)	Still relevant (to ensure inter-communication between SOLAS and non-SOLAS vessels).	NOC
344	Exhaustion of MMSI	For consideration by WRC-07 Agenda item 1.16. **BR Report to each WRC.**	–
345	Operation of GMDSS equipment on non-compulsory fitted vessels	Still relevant; ongoing activities. May need some updates in view of the completion of some actions.	NOC/MOD
349	False alerts in GMDSS	Still relevant; ongoing activities.	NOC

Res. No.	Subject	Remark	Comments
Resolutions			
351	Review of channel arrangements in the maritime allocations in MF and HF bands	For consideration by WRC-07 Agenda item 1.13.	–
352	Use of carrier frequencies 12 290 kHz and 16 420 kHz for safety related calling to and from RCC	Still relevant.	NOC
353	Use of MMSI for equipment other than shipborne mobile equipment	For consideration by WRC-07 Agenda item 1.16. Implemented by BR (details in the **BR Report to WRC-07**).	–
405	Frequencies for AM(R)	Still relevant; ongoing activities in ICAO.	NOC
413	Use of the band 108-117.975 MHz by aeronautical services	Still relevant. (The subject matter is under consideration by WRC-07, Agenda item 1.6). This Resolution is referred to in ~~RR~~ No. **5.197A**.	–
414	Additional allocations for aeronautical mobile (R) service in the bands between 108 MHz and 6 GHz	For consideration by WRC-07 Agenda item 1.6.	–
415	Study of current satellite frequency allocations that will support the modernization of civil aviation	For consideration by WRC-07 Agenda item 1.6.	–
506	GSO only, in BSS bands (12 GHz)	Still relevant, however may need updates to reflect the decisions of WRC-2000 and WRC-03 regarding the adoption of new Regions 1 and 3 Plans and Lists.	MOD
507	Agreements/Plans for BSS	Still relevant, text recently updated (at WRC-03). This Resolution is referred to in ~~RR~~ No. **5.311**.	NOC
		As a consequence, a reference to Resolution **33** might need to be revised if Resolution **33** is suppressed.	MOD
517	Introduction of digital and SSB modulations in the HFBC	Still relevant; text recently updated (at WRC-03). ITU-R studies are ongoing. This Resolution is referred to in ~~RR~~ No. **5.134**.	NOC
525	Introduction of HDTV in 22 GHz	Still relevant; ongoing activities. Some updates might be necessary. A former version of this Resolution is referred to in ~~RR~~ No. **5.530**.	MOD
526	Additional provisions for HDTV	Still relevant. For consideration by a future WRC.	NOC

Res. No.	Subject	Remark	Comments
Resolutions			
527	Terrestrial VHF digital sound broadcasting	Some elements are obsolete (in view of the actions taken by RRC-06). Recommendation ITU-R P.1546-2 in force; propagation studies continuing in the ITU-R.	MOD
528	BSS (sound) in 1.5 GHz	Still relevant. For consideration by a future WRC. This Resolution is referred to in ~~RR~~ Nos. **5.417A** and **5.418**. A former version of this Resolution is referred to in Nos. **5.345** and **5.393**.	NOC
533	Implementation of certain provisions relating to AP30/30A	Some elements still relevant (e.g. *resolves* 4.2).	NOC
535	Application of Article **12**	Still relevant; text recently updated (at WRC-03).	NOC
536	BSS satellites serving other countries	**Obsolete** (in view of the decision of WRC-2000).	SUP
539	Use of the band 2 630-2 655 MHz for non-GSO BSS	Some elements still relevant, text recently updated (at WRC-03). This Resolution is referred to in ~~RR~~ Nos. **5.417A** and **5.418**.	NOC
543	Provisional RF protection ratios for analogue and digital emissions in HFBC	Still relevant. **Results of ITU-R studies to be reported to WRC-07.** Recommendation ITU-R BS.1615 in force since 2003. Issue on the preliminary agenda for WRC-10, Item 2.6.	NOC
544	Additional spectrum for HFBC	For consideration by WRC-07 Agenda item 1.13.	–
545	Technical and regulatory procedures for the BSS in the 620-790 MHz	For consideration by WRC-07 Agenda item 1.11. This Resolution is referred to in ~~RR~~ No. **5.311**.	–
546	Processing of notices under AP30 and AP30A in accordance with the decisions of WRC-03	Some elements still relevant (e.g. *resolves* 4.2, 4.3, 5.2 and 5.3).	NOC
547	Updating of the “Remarks” columns in AP30/30A	For consideration by WRC-03 Agenda item 7.1. **BR Report to WRC-07.**	–
548	Application of the grouping concept in AP30/30A in Regions 1 and 3	Still relevant.	NOC
608	Use of 1 215-1 300 MHz band by systems in the RNSS (space-to-Earth)	Still relevant; ongoing activities. This Resolution is referred to in ~~RR~~ No. **5.329**.	NOC

Res. No.	Subject	Remark	Comments
		Resolutions	
609	Protection of ARNS from the equivalent epfd produced by RNSS networks and systems in the 1 164-1 215 MHz band	Still relevant; ongoing activities. This Resolution is referred to in ~~RR~~ No. **5.328A**.	NOC
610	Coordination of RNSS networks and systems in the bands 1 164-1 300 MHz, 1 559-1 610 MHz and 5 010-5 030 MHz	Still relevant; ITU-R studies are ongoing (revision to Recommendation ITU-R SM.1633 or draft new Recommendation). This Resolution is referred to in ~~RR~~ No. **5.328B**.	NOC
641	Use of the band 7 000-7 100 kHz	Still relevant.	NOC
642	Earth stations in the amateur satellite service	Still relevant.	NOC
644	Disaster communications	Still relevant (in line with ongoing studies in BR and the ITU-R). Perhaps requires updating to reflect current aspects of the topic.	NOC
646	Public protection and disaster relief	Still relevant (In line with ongoing studies in BR and the ITU-R). Perhaps requires updating to reflect current aspects of the topic.	NOC/MOD
670	Notification and protection of earth stations in the MeteoSat service in the band 1 670-1 675 MHz	Implemented. Recommendation ITU-R SA.1745 (approved 2006) in force. This Resolution is referred to in ~~RR~~ No. **5.380A**.	SUP
703	Calculation methods and interference criteria recommended by ITU R for sharing frequency bands between space radiocommunication and terrestrial radiocommunication services or between space radiocommunication services	Although this Resolution was updated recently at WRC-03, its implementation appears difficult and its value questionable.	SUP
705	Protection of services in 70-130 kHz	Some elements still relevant; for consideration by a future WRC.	NOC
		Invites 1 may be deleted, since the issue has not been on any conference agenda since 1987.	MOD
716	Use of bands around 2 GHz	Still relevant; ongoing activities. Some updates might be necessary, progress reports to WRCs. Recommendation ITU-R F.382-8 providing RF channelling arrangements in these bands (referring to this Resolution) was approved in 2006. A former version of this Resolution is referred to in ~~RR~~ Nos. **5.389A**, **5.389C** and **5.390**.	MOD

Res. No.	Subject	Remark	Comments
Resolutions			
728	Non-GSO MSS in 470-862 MHz	Studies have been completed. Bands referenced are being considered under Agenda items 1.4 and 1.11.	SUP
729	Adaptive systems at MF/HF	For consideration by WRC-07 Agenda item 1.13.	–
731	Sharing and adjacent-band compatibility between active and passive services above 71 GHz	Still relevant; ongoing studies. Issue on the preliminary agenda for WRC-10, Item 2.7. References to Recommendations ITU-R RA.769 and SA.1029 out-of-date (should be 769-2 and 1029-2).	NOC
732	Sharing between active services above 71 GHz	Still relevant; ongoing studies. Issue on the preliminary agenda for WRC-10, Item 2.7. Several Recommendations in force (approved 2006) concerning EESS and SRS above 71 GHz.	NOC
734	Use of HAPS in the FX/MO in the bands above 3 GHz allocated exclusively to terrestrial services	Still relevant; ongoing studies (for consideration by a future WRC). Recommendation ITU-R F.1764 (approved 2006) in force.	NOC
		May not be necessary to retain this resolution since it only refers to a future conference and the issue may in any case be included in the agenda of a future conference if agreed by the membership.	SUP
738	Compatibility analyses between EESS (passive) and active services	For consideration by WRC-07 Agenda Item 1.20.	–
739	Compatibility between RA and active space services	For consideration by WRC-07 Agenda item 1.21. This Resolution is referred to in ~~RR~~ No. **5.347A**.	–
740	Future compatibility analyses between RA and active space services	For consideration by WRC-07 Agenda item 1.21.	–
741	Protection of RA in the bands 4 990-5 000 MHz	Still relevant. (Reference to Recommendation ITU-R RA.1513 should be ITU-R RA.1513-1). This Resolution is referred to in ~~RR~~ No. **5.443B**.	NOC
742	Use of the band 36-37 GHz	For consideration by WRC-07 Agenda item 1.2.	–
743	Protection of single-dish RA stations in the band 42.5-43.5 GHz	Still relevant. This Resolution is referred to in ~~RR~~ Nos. **5.551H** and **5.551I**.	NOC

Res. No.	Subject	Remark	Comments
		Resolutions	
744	Sharing between MSS (Earth-to-space) and other services in the bands 1 668-1 668.4 MHz and 1 668.4-1 675 MHz	For consideration by WRC-07 Agenda item 1.7. This Resolution is referred to in ~~RR~~ No. **5.379D**.	–
745	Protection of existing services from secondary NGSO/FSS networks around 1.4 GHz	For consideration by WRC-07 Agenda item 1.17. This Resolution is referred to in ~~RR~~ No. **5.339A**.	–
746	Issues dealing with allocations to science services	For consideration by WRC-07 Agenda item 1.2.	–
747	Possible upgrade of the radiolocation service allocation in 9 000-9 200 MHz and 9 300-9 500 MHz and possible extension of the EESS (active) and SRS (active) in the band 9 500-9 800 MHz	For consideration by WRC-07 Agenda item 1.3.	–
802	Agenda for WRC-07	**Obsolete** in view of the actions taken by the Council (Resolution 1227).	SUP
803	Preliminary agenda for WRC-10	For consideration by WRC-07 Agenda item 7.2.	–
900	Review of the RoP for No. 9.35	Parts still relevant.	MOD
901	Determination of the orbital arc separation	Parts still relevant. Implicitly under Agenda item 1.12 of WRC-07; ITU-R studies are ongoing	MOD
902	Provisions related to earth stations located on board vessels, in FSS networks in 5 925-6 425 MHz and 14-14.5 GHz	Still relevant. Recommendation ITU-R S.1587-1 in force and ITU-R studies are ongoing. This Resolution is referred to in ~~RR~~ Nos. **5.457A**, **5.457B**, **5.506A** and **5.506B**.	NOC
950	Consideration regarding the use of frequencies between 275 and 3 000 GHz	Still relevant; ITU-R studies are ongoing. Issue on the preliminary agenda for WRC-10, item 2.2.	MOD
951	Options to improve the international spectrum regulatory framework	Still relevant. **Progress report in the Director's report to WRC-07, Agenda item 7.1**.	-
952	Studies regarding devices using UWB technology	Still relevant; *Instructs the Director* implemented. Four Recommendations (approved 2006) on UWB in force and further studies foreseen.	NOC
		No longer relevant.	SUP

Rec. No.	Subject	Remark	Comments
Recommendations			
7	Standard forms for licenses	Still relevant.	NOC
8	Automatic identification	Still relevant (in the new context), ongoing studies.	MOD/NOC
9	Operation of BC stations on board ships/aircraft	Still relevant.	NOC
14	Identification of special vessels	Some aspects are obsolete; ongoing studies (e.g. Recommendation ITU-R M.1371) suggest other alternatives.	SUP
34	Principles for allocation of frequency bands	Still relevant; ongoing studies.	NOC
36	International monitoring of emissions from space stations	Still relevant; ongoing studies in SG 1.	NOC
37	Operational procedures for ESV	Still relevant. Recommendation ITU-R S.1587-1 in force and ITU-R studies are ongoing.	NOC
63	Calculation of necessary bandwidth	Still relevant (in the new context). Recommendation ITU-R SM.328-11 (approved 2006) in force; studies continue.	MOD
71	Type approval	Still relevant.	NOC
75	Study of boundary between out-of-band and spurious domains of primary radars using magnetrons	Still relevant; ongoing studies. Recommendation ITU-R SM.1541-2 (approved 2006) in force.	NOC
100	Bands for troposcatter	Still relevant; (updated at WRC-03).	NOC
104	pfd and e.i.r.p. limits	Still relevant; ongoing studies. Some elements are obsolete.	MOD
316	Use of SES within harbours	Some aspects still relevant.	NOC
318	Improved AP18	Still relevant; ongoing studies with a view to present results to a future WRC (implicitly on the WRC-07 Agenda item 1.14)	–
401	Use of worldwide frequencies in AP27	Although this Recommendation contains useful suggestions to administrations, it is observed only by a few administrations.	NOC
503	HFBC	Still relevant.	NOC

Rec. No.	Subject	Remark	Comments
Recommendations			
506	Harmonics in BSS	Still relevant.	NOC
517	RF PR for SSB emissions in HFBC	Implemented.	SUP
520	Elimination of out-of-band HFBC emissions	Still relevant.	NOC
522	Coordination of HFBC schedules	Still relevant.	NOC
604	Characteristics of EPIRBs	Still relevant.	NOC
		EPIRB requirements are defined in SOALAS IV.	SUP
605	Technical characteristics and frequencies for Shipborne transponders	Some aspects are obsolete; ongoing studies (e.g. Recommendation ITU-R M.1371) suggest other alternatives.	SUP
606	The possibility of reducing the band 4 200-4 400 MHz used by radio altimeters in the aeronautical radionavigation service	Still relevant, ongoing studies with a view to present results to a future WRC.	NOC
		No longer relevant.	SUP
608	Guidelines for consultation meetings established by RS609	Still relevant.	NOC
622	Sharing of bands 2 025-2 110 MHz and 2 200-2 290 MHz	Still relevant.	NOC
705	Sharing BC/BSS in 700 MHz	Still relevant, ongoing studies (some elements are obsolete). This Recommendation is referred to in ~~RR~~ No. **5.311**.	MOD
707	Sharing in 32-33 GHz	Still relevant, ongoing studies with a view to present results to a future WRC. Recommendation ITU-R S.1151 in force. This Recommendation is referred to in ~~RR~~ No. **5.548**.	NOC
722	Review of technical, operational and frequency issues for terrestrial wireless interactive multimedia applications	Ongoing studies. Issue for consideration by WRC-10 (Agenda item 2.8) as per Resolution 803.	NOC

Rec. No.	Subject	Remark	Comments
Recommendations			
723	Spectrum usage and operational characteristics for ENG systems	Ongoing studies. **Progress report in the Director's report to WRC-07, Agenda item 7.1.**	–
800	Principles for establishing agendas for WRCs	For consideration under A.I. 7.2	See § 7/7.2/4

Agenda item 5

"to review, and take appropriate action on, the Report from the Radiocommunication Assembly submitted in accordance with Nos. 135 and 136 of the Convention"

Not in scope of CPM

Agenda item 6

"to identify those items requiring urgent action by the Radiocommunication Study Groups in preparation for the next world radiocommunication conference"

Not in scope of CPM

Agenda item 7.1

"to consider and approve the Report of the Director of the Radiocommunication Bureau; on the activities of the Radiocommunication Sector since WRC-03; on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and on action in response to Resolution 80 (Rev.WRC-2000)"

7/7.1/1 Issue A – Resolution 951 (WRC-2003)

Resolution 951 (WRC-03) – Options to improve the international spectrum regulatory framework

The results of the ITU-R studies in response to Resolution **951 (WRC-03)** will be included in the Director's Report. The current status of the ITU-R studies is reported hereafter.

In response to Resolution **951 (WRC-03)**, three possible options have been identified so far for improving the effectiveness, appropriateness and impact of the RR with respect to the evolution of existing, emerging and future applications, systems and technologies. A combination of these options, as well as other options, may also be considered.

Option 1 – Current practice

Under this option, it is considered that there is sufficient flexibility within the present RR and the WRC processes to meet any current or likely future requirements within the time-frame typically set forth for WRCs, 3-4 years.

Although new applications may be introduced in a shorter time-frame, e.g. under RR No. **4.4**, this would be without protection against harmful interference, which may not be practical for the vast majority of emerging wireless applications, including advanced mobile (IMT), scientific, public safety, radiolocation, radionavigation, broadcast, and fixed/mobile/broadcast satellite systems.

The current service definitions in RR Article **1** appear to have generally enabled the RR to be adapted dynamically to latest technology evolution such as IMT, RLANs, Digital TV, PPDR, scientific community interests.

It was noted that, in spite of different definitions for the fixed and mobile (except aeronautical and maritime) services, in most frequency bands where one of the two services is allocated, the other one is also allocated. This indicates that convergence is already achieved in the ITU allocation table, except in some frequency bands, where joint allocations to both services may be considered on a band-by-band basis by future WRCs, as required.

Option 2 – Reviewing and possibly revising some of the current service definitions

Under this option, the current service definitions in RR Article **1** would be reviewed in order to ensure that they adequately and unambiguously cover actual use and emerging technologies. After an extensive consultation within the ITU-R Study Groups, this review may encompass the fixed and mobile (except aeronautical and maritime mobile) services and possibly other services if considered appropriate[1,2]. It may lead to:

– reviewing the current definitions for these services; and modifying them as necessary; and/or

– adding a new service to the list of service definitions, which would encompass several of the existing ones. If such a new service definition was to be included in RR Article **1**, it is understood that any allocation to this new service could only be made by a future WRC.

If this review led to changes in the definitions of the corresponding stations, there may also be a need for consequential changes in the definition of mobile earth stations.

Possible changes to the service definitions would also need to be addressed from the point of view of their regulatory implications in the assignment and use of frequencies, in particular in the ITU coordination, notification and recording process, and impact on assignments made under the current definitions.

Option 3 – The introduction of a new provision in the RR enabling substitution[3] between assignments of specific services

Under this option, a new provision would be introduced in the RR in order to enable substitution between assignments of specific services. For example in the context of fixed and mobile (except maritime and aeronautical mobile) services, substitution could be applied in the same way as it is applied by Nos. **5.485** or **5.492** in the context of the fixed-satellite and broadcasting-satellite services.

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[1] In relation to the possible need to include the broadcasting service in this review, the corresponding definition might be affected by this review.

[2] The ITU-R studies indicated that the current definition of the fixed-satellite service has been able to accommodate new technologies and applications in the fixed-satellite service.

[3] This term needs to be defined properly.

Using the example of fixed and mobile services, this could reflect the current convergence between the services, address the current ambiguities between the definitions of these services, facilitate timely implementation of new applications, provide adequate regulatory protection for such applications and protect the rights of other administrations against interference caused by them. An example of such a new provision could be the following:

ADD

5.XXX Assignments to stations of the fixed service which have been recorded in the MIFR with favourable finding may also be used for transmissions in the mobile (except aeronautical or maritime mobile) service, provided that such transmissions do not cause more interference, or require more protection from interference, than the corresponding assignments in the fixed service recorded in the MIFR. Assignments to stations of the mobile (except aeronautical or maritime mobile) service which have been recorded in the MIFR with favourable finding may also be used for transmissions in the fixed service, provided that such transmissions do not cause more interference, or require more protection from interference, than the corresponding assignments to the mobile (except aeronautical or maritime mobile) service recorded in the MIFR.

It is recognized that implementation of this approach would require necessary tools for the Bureau to assess the compliance of a proposed use of this provision. In the absence of such tools, the provision could only be applied in cases where the interference situation is obviously unchanged (e.g. when the same parameters are used for both services).

Regulatory/procedural aspects

Some administrations reported difficulties in classifying certain applications under one service or another due to different views on the scope of the definitions and the emergence of new technologies and applications. Hence, administrations may not always be clear on the best course of action to be followed in the current ITU regulatory procedures. In order to resolve these difficulties, one possible option was proposed which was to review and possibly amend the service definitions in RR Article **1**.

The objective of changing or merging service definitions to reflect technological evolution may affect the rights of administrations under the existing procedures and may require modifications to them, as well as transitional arrangements.

Focusing on the differences in the notification procedures applicable to the fixed service, the land mobile service and the broadcasting service, the following conclusions were reached[4]:

1) It is important to stress the need for a timely adaptation of the RR to respond to changes in technology and demand for content, infrastructure and service provision.

2) In the RR, the rights of administrations to deploy, operate and protect different services in various bands are derived from the application of the relevant coordination and notification procedures, in particular RR Article **11** and the associated RR Appendix **4**, to stations belonging to these services. These procedures are dependant on the service, which highlights the importance of classifying applications into appropriate service definitions and to review definitions and procedures jointly in order to reflect technological evolution.

3) Under the current situation, when an improvement in the RR is required, the present WRC process allows adjustments to the needs of Member States within a 3-6 year time-frame. The current allocation Table may lead to the following limitations in view of the convergence of services:

   a) in frequency bands where the fixed, mobile and broadcasting services have different status, the application of the relevant ITU procedures to networks encompassing applications relating to each of the three services may lead to a situation where these applications have different rights, hence limiting the deployment of such networks.

      This is a significant limitation in an era where these services with different allocation status appear to be converging;

   b) such situations may be resolved by reviewing the corresponding allocations with a view to obtain the same status for these three services in specific frequency bands, as necessary (e.g. 790-862 MHz, 3.4-3.8 GHz, according to the allocations);

   c) although new applications may be introduced in shorter time-frames in specific bands (ISM), or under specific regulatory conditions (RR No. **4.4**, or special agreements under RR Article **6**), their wider deployment may be constrained by a lack of protection, spectrum or harmonization.

[4] In this document, for simplicity reasons “land mobile” is to be understood as “mobile except aeronautical or maritime mobile”.

4) The differences in the notification process at the practical level give an indication of how the existing rights of administrations may be affected by changes to the underlying regulatory definitions. This indication is an important step in assessing the merits of making such changes.

5) The essential differences in the definitions of the fixed service, the land mobile service and the broadcasting service, relate to the fact that fixed stations, base stations in the mobile service and transmit broadcasting stations are intended to be operated at specified points, whereas mobile terminals or broadcasting receivers are intended to be operated at unspecified points, i.e. their exact location within a given geographic area is not known and they may be operated anywhere within the relevant service area.

6) In these three services, similar situations arise with point-to-multipoint (or point to area) networks, for which the treatment in the notification forms is similar and the RR therefore already reflect convergence from a procedural perspective.

7) In the case of multipoint-to-point networks, convergence between the fixed service and the mobile service is not reflected in the procedures. In this case, convergence from a procedural perspective may be achieved by the adoption of modified or new notification forms enabling bulk notification of unspecified fixed transmit stations. In this respect, the Director of the Bureau indicated in his report to the CPM that suitable notice forms could be generated easily.

8) In order to respond to the pace of technological development, it may be considered desirable to revise or merge the current service definitions, as proposed under **Option 2** above, so as to accommodate changes in demand, attributes and usage in radiocommunication services. This may require modifications to the current procedures so as to match the modified service definitions. Inevitably such changes would affect the current rights of administrations and before deciding on such changes, a proper evaluation would need to be made in this respect.

Other possible approaches under **Option 2** would be:

– to add a new service definition which would encompass several of the existing ones. Once a competent WRC would have added this new service, it is understood that subsequent WRCs may consider band by band allocations, taking into account the results of the relevant compatibility studies;

– to revise the fixed service definition to permit certain fixed applications with ubiquitous transmit terminals which would be operated at unspecified points;

– to revise the fixed and/or mobile definitions to allow certain applications which may not fit in either definition.

9) A change in the format of notification forms as described in 7) or a change in the service definitions as described in 8) (**Option 2** above) would, however, be equivalent to a global allocation to the land mobile service in all frequency bands where the fixed service is currently allocated, with the same status as the fixed service, and vice-versa.

Since most of the frequency bands currently allocated to the fixed service but not to the land mobile service are shared with other terrestrial or space services, such a change may affect such services[5] and would be more appropriately addressed through band-by-band allocation decisions in future competent WRCs, taking into account the results of the relevant compatibility studies.

To enable the possible changes referred to in § 7 and 8, their implications in technical, regulatory and procedural terms would therefore need to be properly evaluated.

10) Another option (**Option 3** above) would be to operate fixed and land mobile services under each other's allocations within the envelope of existing assignments. This option may be seen as an alternative way of enabling convergence between services, which derives from commonality in regulatory treatment.

However, in the case of multipoint-to-point networks, using land mobile under the umbrella of a fixed service assignment would be difficult since a specified point of reference covering a fixed service application cannot simply be made unspecified to cover the substitution of a mobile network while keeping the same interference envelope. Further study would be needed in such situations in order to include appropriate geographical factors when setting the criteria to enable substitution of assignments within two services.

Conclusion

Consistent with Resolution 71 (PP-06), which contains the Strategic Plan of the Union for 2008-2011, in order to meet the requirements of the membership for spectrum, orbit access and operations in application of the Constitution, in light, *inter alia*, of the accelerating convergence of radiocommunication services, the RR should continue to be re-appraised periodically. The ITU-R studies in response to Resolution **951 (WRC-03)** have shown that any change intended to improve the flexibility of administrations in accommodating converging services has to rely on a combination of service definitions, allocations and procedures. Improving flexibility of the RR and the timeliness of their implementation will therefore require continuation of the studies, with more focus on the allocation and sharing issues.

[5] In bands shared with space services, notification of fixed stations operating at unspecified points is currently not permitted.

In considering the results of the ITU-R studies in response to Resolution **951 (WRC-03)**, if WRC-07 decides to place this subject on the agenda of WRC-11, it is suggested that appropriate sharing studies be requested to the ITU-R in specified frequency bands, as considered appropriate, so that the potential impact in technical, regulatory and procedural terms is properly evaluated.

7/7.1/2 Issue B – Recommendation 723 (WRC-03)

Recommendation 723 (WRC-03) – Spectrum usage and operational characteristics of electronic news gathering systems

Executive summary

Recommendation **723 (WRC-03)** recommends that ITU-R to continue the study, as a matter of urgency, of the technical, operational and frequency issues of spectrum usage and operational characteristics of electronic news gathering systems on a global basis. ITU-R has undertaken these studies contained in Report ITU-R BT.2069. ITU-R has also recognized the importance of ENG, TVOB and EFP in the fixed service and has developed Recommendation ITU-R F.1777.

As a Method to satisfy Issue B the ITU-R considers that it is important that WRC-07 to consider the approval of a Resolution [ENG] (WRC-07) calling for studies to establish whether it is feasible to, and to what extent, worldwide harmonization of user requirements and spectrum usage for electronic news gathering may be achievable in terms of the frequency bands used for such applications, including the identification of specific band(s).

7/7.1/2.1 Background

Television has emerged as the primary delivery method of news to the general public. Advances in television news coverage have led to a high level of expectation for a comprehensive and instant coverage of news events on television. Television audiences have increased considerably since the present radio-frequency spectrum allocations for terrestrial electronic news gathering (ENG) were identified. This has produced the effect of increasing the probability of occurrence of news worthy events whilst also increasing the number of camera crews, vehicles and hence radio-frequency spectrum transmission channels which are needed. Broadcasters use auxiliary spectrum in ways that are both static and dynamic. Dynamic uses tend to be driven by both the predictable (scheduled events and newscasts) and the unpredictable (breaking news, emergencies and disasters). The resulting spectrum usage patterns vary significantly over time with respect to the amount of spectrum required. The broadcasting industry has managed these usage patterns through its own, industry-wide voluntary frequency coordination programmes. But with less and less spectrum readily available, even the best management programme will not be effective.

The definitions for ENG and television outside broadcasting (TVOB) including sound reporting applications are now contained in Report ITU-R BT.2069 as services ancillary to broadcasting (SAB). These were originally confined just to those applications required by public broadcasting companies in the preparation of programme material, while services ancillary to programme making (SAP) covered programme making by independent companies along with the commercials, theatre shows, concerts and sporting events. For better understanding of differences between ENG and OB, refer Figs. 1 and 2 in Report ITU-R BT.2069.

7/7.1/2.2 Summary of studies

ITU-R established a questionnaire to collect data from administrations in relation to spectrum usage and user requirements for ENG, TVOB and electronic field production (EFP) distributed as Administrative Circular CA/131 in 2003. As a result of these studies, Report ITU-R BT.2069, on the status of studies on spectrum usage and user operational requirements for ENG, TVOB and EFP has been developed.

ITU-R has also recognized the importance of ENG, TVOB and EFP in the fixed service and has developed Recommendation ITU-R F.1777.

The summary of studies are:

Local and national sound broadcast stations use SAP/SAB services for news gathering, traffic reporting, sports reporting, and other applications. Events covered by the outside broadcasts are extraordinary in terms of the attention they attract, their size, large geographical scales. The public interest is served by live news coverage of breaking events, especially disasters or potential disasters affecting public safety.

The spectrum bands used to date for ENG, TVOB and EFP have a number of inherent technical attributes which make them more suitable than some other radio-frequency spectrum bands for broadcast auxiliary service (BAS) operations. BAS operating in low radio-frequency spectrum bands tends to provide better propagation characteristics over obstructed paths, thereby increasing the probability of a successful transmission from any particular venue.

The frequency bands utilized needs to take account of technology applied in one country to a specific application needs to take account of the possibility equipment used may be brought by overseas bodies into operation in another country. Direct comparison between national assignments made between countries is difficult because of the different regulations which apply to the use of various bands for a range of broadcast “ancillary” uses. The very nature of news gathering in a competitive environment implies a high probability that several television broadcasters/organizations/networks will be attempting to cover the same situation. This requires several channels to operate simultaneously over virtually the same path.

ITU-R studies have provided an inventory of bands used for video SAP/SAB links. Many ITU administrations have made spectrum allocations for analogue and digital ENG, TVOB and EFP. Some are reflected in Recommendation ITU-R F.1777. ITU-R has further been advised that there are sharing issues between SAP/SAB and other services in a number of frequency bands.

7/7.1/2.3 Analysis of the results of studies

Changes in the nature of TV programming have impacted significantly on the further development of SAP/SAB. It is estimated that altogether terrestrial ENG operators providing news coverage with high density of news events (typically capital and other big cities) may require allocation of up to 50 talkback narrow-band channels, 30 wideband channels for radio microphones and 10 channels for various video links.

Prediction of demand for sound broadcasters over the next 10 years indicate that the number of channels for audio links and for radio microphones may approximately double, totalling up to 20 audio link channels and 10 radio microphones channels.

It is observed in Report ITU-R BT.2069 that frequency bands utilized for ENG, TVOB and EFP in one country to a specific application needs to take account of the possibility equipment used may be brought by overseas bodies into operation in another country. Harmonized band planning by administrations would enhance the viability of staging events at varied locations.

Broadcasters are now considering reduction in transmission bandwidths within the radio-frequency spectrum bands assigned to ENG via reduced deviation analogue frequency modulation (FM) and the eventual migration to digital modulation schemes. These might result in improved productivity. However these potential gains are more than offset by the increased demand for higher quality contribution material required for digital television services, including high definition television (HDTV).

ITU-R studies have shown that while the actual demand for SAP/SAB spectrum varies significantly between different countries, different programme makers and different events, the overall trend is that of steady increase of SAP/SAB demand in most of the sectors. Report ITU-R BT.2069 expresses concerns regarding the unregulated use of indoor, mobile and hand-held systems that cause interference to radiocommunication services in support of broadcast systems. Report ITU-R BT.2069 compares the performance of contemporary analogue radio microphones with digital radio microphones.

ITU-R studies suggest it was not possible to make a reliable estimate as to the performance characteristics and co-existence capabilities of future digital radio microphones. The band 470-862 MHz appears as the vital tuning range for audio SAP/SAB applications.

Recommendation ITU-R F.1777 provides an inventory of bands for video SAP/SAB links. Many ITU administrations have made spectrum allocations for analogue and digital ENG, TVOB and EFP. It should be noted that, several administrations have advised that they have ENG, TVOB and EFP assigned as the mobile service in a number of frequency bands. It should also be noted that, there are sharing issues between SAP/SAB and other services in a number of frequency bands.

7/7.1/2.4 Method to satisfy Issue B

ITU-R considers that it is important that WRC-07 to consider the approval of a Resolution **[ENG] (WRC-07)** calling for studies to establish whether it is feasible to, and to what extent, worldwide harmonization of user requirements and spectrum usage for electronic news gathering may be achievable in terms of the frequency bands used for such applications, including the identification of specific band(s).

An example of a draft Resolution **[ENG] (WRC-07)** is as follows:

ADD

DRAFT RESOLUTION [ENG[6]] (WRC-07)

Spectrum harmonization for use by terrestrial electronic news gathering, electronic field production, TV outside broadcast

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the use of portable and nomadic radio equipment by services ancillary to broadcasting, commonly described as electronic news gathering (ENG), operating terrestrially in appropriate fixed and mobile service bands is now an important element in comprehensive coverage of noteworthy public events in administrations;

b) that WRC-03 established Recommendation **723** to continue the study, as a matter of urgency, of the technical, operational and frequency issues of spectrum usage and operational characteristics of portable and nomadic links for terrestrial electronic news gathering systems (ENG links) on a global basis;

c) that television broadcasting has emerged as the primary delivery method of news to the general public, within all countries and globally, and public interest is served by live news coverage of breaking events, both developmental and potential disasters affecting public safety;

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6 For the purpose of this Resolution, ENG represents all the services ancillary to broadcasting such as terrestrial electronic news gathering, electronic field production, TV outside broadcast, wireless radio microphones and radio outside production and broadcast.

d) that the growth in the use of the frequency bands between 500 MHz and 10 GHz for mobile, satellite and other radiocommunication applications has significantly reduced the flexibility of some administrations in providing adequate and appropriate spectrum to meet the increasing demand for ENG;

e) that, based on studies, ITU-R considers it of great importance that WRC-07 approve a Resolution to establish whether, and to what extent, worldwide harmonization of spectrum usage and user requirements for ENG links may be achievable in terms of the frequency bands used for such applications, including the identification of specific band(s);

f) that there are serious concerns regarding the unregulated use of indoor, mobile, and hand-held systems that cause interference to the ENG services in support of broadcast systems;

g) that modularization and miniaturization of terrestrial ENG systems has increased the portability for these systems to be transported from one country to another;

h) that has established Recommendation ITU-R F.1777 that identifies system characteristics of television outside broadcast (TVOB), ENG and electronic field production (EFP) in the fixed service for use in sharing studies,

noting

a) that Recommendation ITU-R F.1777 identifies frequency tuning ranges for analogue and digital TVOB, ENG and EFP for use in sharing studies;

b) that studies undertaken by ITU-R, contained in Report ITU-R BT.2069, indicate that spectrum planning in many countries could benefit from harmonized band planning, thereby enhancing the viability of spectrum usage by ENG systems;

c) that the studies cited in *noting a)* above are based on data collected from many administrations in all Regions on spectrum usage and user requirements for links used in ENG;

d) that these data obtained from many administrations identify a multitude of frequency ranges for various applications of sound, television and Internet broadcasting;

e) that harmonized band planning by administrations would enhance the viability of staging the electronic news gathering, TV outside broadcasting and electronic field production events at varied locations on a worldwide basis;

f) that spectrum bands already identified for these services have a number of inherent technical attributes making them more suitable for ENG operations;

g) that lower radio-frequency spectrum bands tend to provide better propagation characteristics over obstructed paths, thereby increasing the probability of a successful transmission of sound, television and internet broadcasting content operating from any particular venue;

h) that broadcasters are now considering reduction in transmission bandwidths within the radio-frequency spectrum bands assigned to ENG and the eventual migration from analogue to digital modulation schemes;

i) that many ITU administrations have made spectrum allocations for analogue and digital ENG within their national regulatory frameworks,

recognizing

a) that television audiences have increased significantly since the current radio-frequency spectrum allocations to ENG were identified and there is a continuing increase in demand for the quantity and quality of coverage of electronic news gathering, TV outside broadcasting and electronic field production events;

b) that broadcasters now embrace technologies, not even anticipated when spectrum-usage regulations were created, for both static and dynamic usage;

c) that dynamic uses tend to be driven by both the scheduled events and by the unpredictable events – breaking news, emergencies and disasters;

d) that the very nature of news gathering and electronic production in a competitive environment implies a high probability that several television broadcasters/organizations/networks will be attempting to cover the same situation, requiring several channels to operate simultaneously over virtually the same path;

e) that spectrum needs are required to take account of technology applied to an application in one country and the possibility equipment used in that application may be brought by overseas bodies into another country,

resolves

1 that [WRC-11][a future competent conference] should address the feasibility of, and the extent there-of , for worldwide/regional harmonization of spectrum usage for ENG in terms of the frequency bands and tuning ranges used for such applications, including the identification of preferred specific band(s);

2 that ITU-R take up studies on spectrum harmonization in preparation for [WRC-11] [a future competent conference];

3 that ITU-R to continue updating its Reports and Recommendations on operational characteristics and frequency requirements of the ENG for sound, television and internet broadcasting and provide the results to [WRC-11][a future competent conference],

invites administrations

to participate in ITU-R studies by providing contributions.

7/7.1/3 Issue C – Resolution 74 (Rev.WRC-03)

Resolution 74 (Rev.WRC-03) – Process to keep the technical bases of Appendix **7** current.

This issue is under consideration by Study Group 1, as appropriate.

7/7.1/4 Issue D – Resolution 547 (WRC-03)

Resolution 547 (WRC-03) – Updating of the “Remarks” columns in the Tables of Article 9A of RR Appendix **30A** and Article 11 of RR Appendix **30**

This issue is under consideration by the Bureau and the Director’s Report will be submitted to WRC-07.

7/7.1/5 Issue E – Consideration of the technical parameters for the possible planning of the broadcasting-satellite service in the band 21.4-22 GHz in Regions 1 and 3

Resolution 507 (Rev.WRC-03) – Establishment of agreements and associated plans for the broadcasting-satellite service

Resolution 525 (Rev.WRC-03) – Introduction of high-definition television systems of the broadcasting-satellite service in the band 21.4-22.0 GHz in Regions 1 and 3

Executive summary

Resolution **525 (Rev.WRC-03)** identifies interim procedures for the introduction of HDTV BSS systems in the band 21.4-22 GHz in Regions 1 and 3, including procedures for systems introduced before 1 April 2007, and procedures for systems introduced before the next competent Conference following the 2007 Conference.

There are two options, which may satisfy Issue E:

To deal with the technical parameters for the possible planning of the broadcasting-satellite service in the band 21.4-22 GHz in Regions 1 and 3, two options have been identified:

1) request WRC-07 to include on the agenda of WRC-10 an item to consider RR No. **5.530**, taking into account Resolutions **507 (Rev.WRC-03)** and **525 (Rev.WRC-03)**, with a view to planning of the BSS band 21.4-22 GHz in Regions 1 and 3 at WRC-11;
2) revise Resolution **525 (Rev.WRC-03)**.

ITU-R has concluded that Resolution **525 (Rev.WRC-03)** should be revised taking into account the results of studies stated in § 7/7.1/5.2 above, and that further study is needed to consider the planning of the BSS band 21.4-22 GHz in Regions 1 and 3.

7/7.1/5.1 Background

Resolution **525 (Rev.WRC-03)** identifies interim procedures for the introduction of HDTV BSS systems in the band 21.4-22 GHz in Regions 1 and 3, including procedures for systems introduced before 1 April 2007, and procedures for systems introduced before the next competent Conference following the 2007 Conference. Annex 5 of the Report from CPM06-1 includes a footnote regarding Agenda item 7.1 which identifies the requirement for urgent studies by the ITU-R concerning the technical parameters for the possible planning of the broadcasting-satellite service in the band 21.4-22 GHz in Regions 1 and 3, and invites the Director of the BR to include the status of these studies in his Report to WRC-07.

7/7.1/5.2 Summary of studies

ITU-R has studied the technical issues associated with the possible planning of the BSS in the band 21.4-22.0 GHz in Regions 1 and 3, including mitigation techniques for rain attenuation, system parameters, power flux-density levels and intra-service sharing criteria. The results of these studies with regard to the technical issues associated with the BSS in the band 21.4-22 GHz are contained in the following ITU-R texts:

– Recommendation ITU-R BO.1659 recommends techniques to mitigate rain attenuation to facilitate the introduction of BSS systems in frequency bands between 17.3 GHz and 42.5 GHz, especially in the 21 GHz band;
– Recommendation ITU-R BO.1776 recommends that the value −105.0 dB(W/(m^2 · MHz)) be considered as the reference power flux-density (pfd) at the Earth's surface for the sharing study for the BSS in the band 21.4-22.0 GHz in Regions 1 and 3;
– draft new Recommendation ITU-R BO.[Doc. 6/310] provides a pfd mask for sharing among BSS systems in the band 21.4-22.0 GHz that may be used by administrations to trigger coordination for BSS systems intended to operate in accordance with Resolution **525 (Rev.WRC-03)**;
– Report ITU-R BO.2071 describes system parameters of BSS systems in frequency bands 21.4-22.0 GHz and the associated feeder links.

7/7.1/5.3 Analysis of the results of studies

To deal with the technical parameters for the possible planning of the broadcasting-satellite service in the band 21.4-22 GHz in Regions 1 and 3, two options have been identified:

1) request WRC-07 to include on the agenda of WRC-11 an item to consider RR No. **5.530**, taking into account Resolutions **507 (Rev.WRC-03)** and **525 (Rev.WRC-03)**, with a view to planning of the BSS band 21.4-22 GHz in Regions 1 and 3 at WRC-11;

2) revise Resolution **525 (Rev.WRC-03)**.

ITU-R has concluded that Resolution **525 (Rev.WRC-03)** should be revised taking into account the conclusions stated in § 7/7.1/5.2 above, and that further study is needed to consider the planning of the BSS band 21.4-22 GHz in Regions 1 and 3.

An example of a possible revision of Resolution **525 (Rev.WRC-03)** is as follows. The date into force of the corresponding provisions (DDMM) should be decided at WRC-07.

MOD

RESOLUTION 525 (Rev.WRC-0~~3~~7)

Introduction of high-definition television systems of the broadcasting-satellite service in the band 21.4-22.0 GHz in Regions 1 and 3

The World Radiocommunication Conference (Geneva, 200~~3~~7),

considering

a) that WRC-92 has reallocated the band 21.4-22.0 GHz in Regions 1 and 3 to the broadcasting-satellite service (BSS) to be implemented after 1 April 2007;

b) that until 1 April 2007 the existing services operating in the band 21.4-22.0 GHz in Regions 1 and 3 in accordance with the Table of Frequency Allocations are therefore entitled to continue operating without harmful interference from other services;

c) that it is nevertheless desirable to facilitate the introduction of experimental high-definition television (HDTV) systems in this band before 1 April 2007 without affecting the continued operation of existing services;

d) that it also may be possible to introduce operational HDTV systems in this band before 1 April 2007 without affecting the continued operation of existing services;

e) that after 1 April 2007 the introduction of HDTV systems in this band must be regulated in a flexible and equitable manner until such time as a future competent world radiocommunication conference has adopted definitive provisions for this purpose in accordance with Resolution **507 (Rev.WRC-03)**;

f) that procedures are required for the ~~three sets of~~ circumstances envisaged in *considering~~s c), d)~~* ~~and~~ *e)* above,

further considering

a) that mitigation techniques for rain attenuation for the BSS have been developed and given in Recommendation ITU-R BO.1659;

b) that in the band 21.4-22.0 GHz in Regions 1 and 3, reference power flux-density for the BSS have been developed and given in Recommendation ITU-R BO.1776;

c) that in the band 21.4-22.0 GHz in Regions 1 and 3, intra-service sharing criteria for GSO BSS systems have been developed and given in Recommendation ITU-R BO.[Doc. 6/310];

d) that in the band 21.4-22.0 GHz in Regions 1 and 3, system parameters of BSS between 17.3 GHz and 42.5 GHz and associated feeder links have been developed and given in Report ITU-R BO.2071,

noting

a) that Recommendation ITU-R BT.1201 contains extremely high resolution imagery (EHRI);

b) that Recommendation ITU-R BT.1769 contains parameter values for an expanded hierarchy of large screen digital imagery (LSDI) image formats for production and international programme exchange;

c) that in future BSS system in the band 21.4-22.0 GHz, HDTV applications may include such EHRI applications as shown in Report ITU-R BT.2042,

resolves

to adopt the interim procedures contained in the Annex hereto with effect from ~~1 April 1992~~ [DDMMYYYY],

invites all administrations

to comply with the above procedures,

instructs the Radiocommunication Bureau

to apply the above procedures.

ANNEX TO RESOLUTION 525 (Rev.WRC-0~~3~~7)

Interim procedures for the introduction of BSS (HDTV) systems in the band 21.4-22.0 GHz in Regions 1 and 3

NOC

Section I – General provisions

1 It shall be understood that prior to 1 April 2007 all existing services in the band 21.4-22.0 GHz in Regions 1 and 3 operating in accordance with the Table of Frequency Allocations shall be entitled to continue to operate. After that date they may continue to operate, but they shall neither cause harmful interference to BSS (HDTV) systems nor be entitled to claim protection from such systems. It shall be understood that the introduction of an operational BSS (HDTV) system in the band 21.4-22.0 GHz in Regions 1 and 3 should be regulated by an interim procedure in a flexible and equitable manner until the date to be decided by a future competent conference.

SUP

~~Section II – Interim procedure relating to experimental BSS (HDTV) systems introduced before 1 April 2007~~

~~2 For the purpose of introducing experimental BSS (HDTV) systems in the band 21.4-22.0 GHz in Regions 1 and 3 before 1 April 2007 under the provisions of Article **27**, the procedures contained in Sections A to C of Resolution **33 (Rev.WRC-03)** or in Articles **9** to **14**, as appropriate (see *resolves* 1 and 2 of Resolution **33 (Rev.WRC-03)**), shall be applied.~~

SUP

~~Section III – Interim procedure relating to operational BSS (HDTV) systems introduced before 1 April 2007~~

~~3 For the purpose of introducing operational BSS (HDTV) systems in the band 21.4-22.0 GHz in Regions 1 and 3 before 1 April 2007, the procedure contained in Resolution **33 (Rev.WRC-03)** shall be applied, if the power flux-density at the Earth's surface produced by emissions from a space station, on the territory of any other country, exceeds:~~

~~–115 dB(W/m^2) in any 1 MHz band for angles of arrival between 0° and 5° above the horizontal plane; or~~

~~– 105 dB(W/m²) in any 1 MHz band for angles of arrival between 25° and 90° above the horizontal plane; or~~

~~– values to be derived by linear interpolation between these limits for angles of arrival between 5° and 25° above the horizontal plane.~~

~~These limits relate to the power flux-density which would be obtained under assumed free-space propagation conditions.~~

~~4 If the power flux-density at the Earth's surface produced by emissions from a space station does not exceed these limits, the procedure in Section A of Resolution **33 (Rev.WRC-03)** or No. **9.11**, as appropriate (see *resolves* 1 and 2 of Resolution **33 (Rev.WRC-03)**) shall not be applied.~~

MOD

Section ~~IV~~II – Interim procedure relating to BSS (HDTV) systems introduced after 1 April 2007

~~5~~2 For the purpose of introducing and operating BSS (HDTV) systems in the band 21.4-22.0 GHz in Regions 1 and 3 after 1 April 2007, and before a future conference has taken decisions on definitive procedures, all relevant provisions of Articles **9** to **14** except No. **9.11** shall be applied.

~~6 For the purpose of this Section, BSS (HDTV) systems introduced under provisions of Sections II and III of this Resolution shall be taken into account.~~

~~7~~3 Administrations shall, to the maximum extent possible, seek to ensure that operational BSS (HDTV) systems introduced in the band 21.4-22.0 GHz in Regions 1 and 3 ~~under Sections III or IV of this Resolution~~ have characteristics which take into account the studies of the ITU-R for the preparation of a future competent world radiocommunication conference.

7/7.1/6 Issue F – Technical aspects of use of terrestrial optical free-space telecommunications

Resolution 118 (Marrakesh, 2002) – Use of spectrum at frequencies above 3 000 GHz

Technical aspects of use of terrestrial optical free-space telecommunications

CPM06-1 identified Issue F "Technical aspects of use of terrestrial optical free-space telecommunications (see PP Resolution 118 (Marrakesh, 2002))" as an item requiring urgent study by the ITU-R study groups. Moreover, PP Resolution 118 (Marrakesh, 2002) instructs the Director, BR, to Report to WRC-07 on the progress of studies concerning the use of frequencies above 3 000 GHz.

The current status of ITU-R studies on this Issue is reflected in the development of the following texts based on approved relevant ITU-R Questions:

– Preliminary draft new Recommendation ITU-R P.[FSO_PREDICT] "Prediction methods required for the design of free-space optical links" (Annex 4 to WP 3M Chairman's Report (Document 3M/178)).
– Preliminary draft new Recommendation ITU-R P.[FSO_ATMOS] "Propagation data required for the design of free-space optical links" (Annex 4 to WP 3J Chairman's Report (Document 3J/159)).
– Working document toward a preliminary draft new ITU-R Report "The possibility and relevance of including in the Radio Regulations frequency bands above 3 000 GHz" (Annex 6 to WP 1A Chairman's Report (Document 1A/134)).
– Preliminary draft new Report "Fixed service applications using frequency bands above 3 000 GHz". (Annex 7 to Working Party 9B Chairman's Report (Document 9B/203)).

7/7.1/7 Issue G – Definition of HDFSS

Executive summary

The ITU-R considered the need for a definition of HDFSS from the regulatory/procedural perspective, and also from the technical/operational perspective.

Since the acronym HDFSS is intended to refer to high density applications within the fixed-satellite service and not to a separate service in the regulatory/procedural sense, and since the only bands identified for such applications in RR Article **5** are permitted also to be used for other FSS applications, the ITU-R study concludes that there is no need for a definition of HDFSS in RR Article **1**. This may satisfy Issue G.

7/7.1/7.1 Background

The ITU-R considered the need for a definition of HDFSS from the regulatory/procedural perspective, and also from the technical/operational perspective.

7/7.1/7.2 Summary of technical and regulatory studies

In view of the wide ranges of application, satellite type, earth station characteristics, carrier parameters and deployment options that may be encompassed under the HDFSS heading, it was found to be impractical to describe the term in a sufficiently succinct form to comprise a usable technical/operational definition.

However, recognizing the need for a common understanding of what is meant by the term, Recommendation ITU-R S.1783 - Technical and operational features characterizing high-density applications in the fixed-satellite service (HDFSS) has been developed. Appropriate account has been taken of Resolution **143 (WRC-03)** Guidelines for the implementation of high-density applications in the fixed-satellite service in frequency bands identified for these applications, and of Recommendation ITU-R S.1594 – Maximum emission levels and associated requirements of high density fixed-satellite service earth stations transmitting towards geostationary fixed-satellite service space stations in the 30 GHz range.

7/7.1/7.3 Analysis of the results of studies

Since the acronym HDFSS is intended to refer to high density applications within the fixed-satellite service and not to a separate service in the regulatory/procedural sense, and since the only bands identified for such applications in RR Article **5** are permitted also to be used for other FSS applications, the ITU-R study concludes that there is no need for a definition of HDFSS in RR Article **1**.

7/7.1/7.4 Method to satisfy Issue G

The ITU-R study concludes that there is no need for a definition of HDFSS in RR Article **1**.

7/7.1/8 Issue H – Definition of HEO

Executive summary

The term “HEO” has been used in several ITU-R Recommendations for different services during the last years. In these Recommendations, HEO has been used either as an undefined term or as an acronym for any of several different types of non-geostationary satellite orbit. The term HEO has not been formally defined in the ITU-R.

As a Method to satisfy Issue H, the ITU-R has come to the following conclusions with regard to HEOs:

– a reconfirmation of the CPM Report to WRC-03, § 3.7.1, “HEO systems are a subcategory of non-GSO systems”;
– it is not possible to briefly define HEO for all space radio services;
– a description of HEO specific to a radiocommunication service other than the FSS could, and for FSS must, include both orbital and operational characteristics;
– a description which includes such characteristics is neither suitable for inclusion nor required to be included in RR Article **1** or Recommendation ITU-R S.673;
– within the FSS, HEO is not an acronym but refers to a type of FSS satellites and systems as characterized in Recommendation ITU-R S.1758 for use in sharing studies.

7/7.1/8.1 Background

The term "HEO" has been used in several ITU-R Recommendations for different services during the last years. In these Recommendations, HEO has been used either as an undefined term or as an acronym for any of several different types of non-geostationary satellite orbit. The term HEO has not been formally defined in the ITU-R.

7/7.1/8.2 Summary of studies

The ITU-R has studied HEO-type systems in both this and the prior study cycle, and supports the statement in the CPM Report to WRC-03, § 3.7.1, that "HEO systems are a subcategory of non-GSO systems."

A governing feature of the ITU-R studies of HEO-type non-GSO systems has been spectrum sharing between HEO-type non-GSO systems and GSO networks. ITU-R has concluded that the nature of HEO-GSO spectrum sharing is strongly dependent on the radio service involved. In some cases, the HEO-GSO sharing is further dependent on the specific frequency bands within a radio service.

ITU-R has also concluded that a description of FSS HEO-type non-GSO systems must include the operational feature known as active arcs, i.e. the portion or portions of the orbit during which FSS service links are transmitted to and from a FSS HEO-type non-GSO space station. This active arc is always outside of, and often separated by large angles from, the line of sight between every point on the Earth's surface and every point on the GSO. However, TT&C links within FSS allocations may be operated while the satellite is outside the active arc. Analysis of interference from TT&C for HEO-type non-GSO systems is the subject of Recommendation ITU-R S.1759.

7/7.1/8.3 Analysis of the results of studies

To deal with the definition of HEO, several possibilities have been considered:

– inclusion of a definition of HEO in RR Article **1**;

– inclusion of a definition of HEO in Recommendation ITU-R S.673;

– creation of a new Recommendation.

Based on the two conclusions stated in § 7/7.1/8.2 above, ITU-R has determined that:

1) descriptions of HEO are radio service-specific; and

2) any description of FSS HEO-type non-GSO systems must include both orbital and operational characteristics.

Such descriptions are too long, too detailed, and too specialized for a definition in RR Article **1** or Recommendation ITU-R S.673, and thus ITU-R has concluded that it is not suitable to define HEO for all services, and that it is not necessary or appropriate to include such a definition either in RR Article **1** or in Recommendation ITU-R S.673.

Notably, ITU-R studies conducted for WRC-03 Agenda item 1.37 also resulted in the conclusion that there is no need to modify RR Article **1** to define HEO (§ 3.7.3.2 of the CPM Report to WRC-03).

A radiocommunication satellite system using HEO is simply a particular type of non-geostationary-satellite orbit (non-GSO) system. It should be noted that according to the current RR, there are only two categories in terms of space networks or space systems using satellite orbits: i.e. networks using the geostationary-satellite orbit and systems using non-geostationary-satellite orbits.

(NOTE – Any space system using a type of satellite, other than a geostationary satellite, which is defined in RR No. **1.189**, is a non-geostationary satellite system. However, although any satellite systems using LEO (low Earth orbits), MEO (medium Earth orbits) or HEO are all non-GSO systems according to the current RR, in some cases different regulations are applied as indicated in RR Nos. **21.16.17** and **21.16.18**.)

For the purposes of sharing studies Recommendation ITU-R S.1758, Characterization of HEO-type systems in the FSS, describes an HEO-type system in the FSS. Based on this Recommendation, it is possible to state the following description:

"Within the FSS, "HEO" is a term that refers to a type of non-GSO satellite system that:

1) includes one or more satellites using elliptical orbits with the following characteristics:
   a) a geosynchronous period (23 h, 56 min) multiplied by m/n where m and n are integers, and the ratio m/n may be less than, equal to, or greater than 1;
   b) a repeating ground track or ground tracks;
   c) an inclination between 35º and 145 º;
   d) an apogee that is at least 18 000 km;
2) has service links operated only while the satellites are in active arcs that do not intersect, and are widely separated from, the line of sight between every point on the Earth's surface and every point on the GSO, as further described in Item 1.1 of § 1 of Annex 1 of Recommendation ITU-R S.1758;
3) has some or all of the other characteristics identified in Items 1.2 through 1.7 of § 1 of Annex 1 of Recommendation ITU-R S.1758."

ITU-R no longer considers HEO to be an acronym for a particular type or types of non-GSO satellite orbit. Rather, for the FSS, HEO is a term that refers to the type of FSS satellites and systems described above. Other space services are free to adopt or not the characterization developed for the FSS.

7/7.1/8.4 Method to satisfy Issue H

In summary, the ITU-R has come to the following conclusions with regard to HEOs:

– a reconfirmation of the CPM Report to WRC-03, § 3.7.1, "HEO systems are a subcategory of non-GSO systems";

– it is not possible to briefly define HEO for all space radio services;

– a description of HEO specific to a radiocommunication service other than the FSS could, and for FSS must, include both orbital and operational characteristics;

– a description which includes such characteristics is neither suitable for inclusion nor required to be included in RR Article **1** or Recommendation ITU-R S.673;

– within the FSS, HEO is not an acronym but refers to a type of FSS satellites and systems as characterized in Recommendation ITU-R S.1758 for use in sharing studies.

7/7.1/9 Issue I – Review of RR No. 23.3 by WRC-07

No. **23.3** of the RR stipulates that: “In principle, except in the frequency band 3 900-4 000 kHz, broadcasting stations using frequencies below 5 060 kHz or above 41 MHz shall not employ power exceeding that necessary to maintain economically an effective national service of good quality within the frontiers of the country concerned.”

After discussion at various meetings the Radio Regulations Board has concluded that it could not provide regulatory interpretation of RR No. **23.3**.

In reviewing the issue at its December 2006 meeting, the Special Committee for regulatory/procedural matters concluded that it was not in a position to provide clarification of RR No. **23.3** for the Bureau.

Following the PP-06 instruction (see PP Doc. 184, Annex A) the CPM07-2, after consideration of Documents 28, 28(Add.1) and 102, acknowledged the importance of this issue and the need for a review of RR No. **23.3** by WRC-07 with possible actions.

7/7.1/10 Incorporation of GE06 coordination and notification data in RR Appendix 4 [7]

7/7.1/10.1 Background

The Regional Radiocommunication Conference (RRC-06) met in Geneva, 15 May - 16 June 2006 and adopted the Regional Agreement relating to the planning of digital terrestrial broadcasting in parts of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz. RRC-06 also adopted Resolution 2 inviting WRC-07 to review, as appropriate, RR Appendix **4** of the with a view to incorporating the characteristics in Annex 3 of the Agreement that are to be submitted to the Bureau for the coordination and notification of assignments within the planning area.

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[7] It was noted that the inclusion of data elements related to the application of procedures that are not part of the RR (e.g. procedures for modification of Plans that are annexed to Regional Agreements) requires careful consideration.

7/7.1/10.2 Summary of technical and regulatory studies

For terrestrial services, Annex 1A to RR Appendix **4** contains the listing of terrestrial data items and Annex 1B to Appendix **4**, a table cross-referencing the data item reference code (from Annex 1A) with the relevant notice forms – T01 to T04 for terrestrial broadcasting including the regional plans prior to GE06, T11 to T17 for fixed and mobile services (including world and regional plans) and AR12 for HFBC. Although this table shows which items are mandatory, the indication for those data items that are only required under specific conditions varies and does not include any explanation of the relevant conditions.

Across the GE06 planning area the broadcasting service shares the frequency bands 174-230 MHz and 470-862 MHz with a range of primary terrestrial services. To permit the harmonious development of these primary terrestrial services, as well as the implementation and further development of the GE06 Plan, complex coordination and Plan implementation procedures were required. In addition, the GE06 Agreement permits, in some cases, other primary terrestrial services to operate under the mask of a digital broadcasting plan entry. Consequently the coordination and notification procedures require the submission of a considerable number of data elements. In order that administrations may easily identify when data needs to be provided, Annex 3 of the GE06 Agreement includes the necessary information specifying not only the requirement but the conditions under which each data item has to be supplied.

To include the GE06 data requirements into Appendix **4**, it is possible to follow the decision of WRC-03 in revising the parts of Appendix **4** and suppress Annex 1A and merge its contents with Annex 1B to Appendix **4**, including within the merged Annex the specific conditions under which data items are required. As noted by WRC-03 this approach also avoids the potential for incompatibilities between the annexes.

7/7.1/10.3 Analysis of the results of studies

For the implementation of the GE06 Agreement, the Bureau has developed ten new notice forms covering digital broadcasting assignments and allotments, analogue broadcasting (during the transition period), terrestrial transmitting and receiving stations and terrestrial typical transmitting stations. Currently Annex 1B to RR Appendix **4** contains data for 12 notices and for some of these notices the information is sub-divided into separate columns based on the class of station, resulting in 16 individual columns. Inclusion of the data from the GE06 Agreement would therefore result in 26 columns. However, the introduction of the conditions under which a data item is required would permit some of these columns to be merged.

Following the decision of WRC-03 in Annex 2 of RR Appendix **4** to separate compound data elements, the same approach has been taken in developing the attached revisions. Also, in the process of preparing the attached revised versions of Annexes 1A and 1B to Appendix **4**, some inconsistencies have been identified in the information and solutions proposed.

This proposed revision of Annexes 1A and 1B to RR Appendix **4** (see Annex 7-1.X) may be considered as a reasonable approach within the limits of the current structure. Nevertheless, the current structure of RR Appendix **4** is not easy to modify and it would be helpful for WRC-07 to have an alternative option for the revision of RR Appendix **4** that increases the extent of the proposed modifications to include revision of the Appendix structure and in particular, the consideration of further rationalization of the notice columns (see Annex 7-1.Y).

An additional consideration is that WRC-03 developed a set of data characteristics to be used for HAPS operating as an IMT-2000 base station in the frequency bands in accordance with Resolution **221**. A revision of RR Appendix **4** at WRC-07 would provide the opportunity for the inclusion of this data used in the application of RR Article **11**.

7/7.1/10.4 Methods to satisfy the agenda item

7/7.1/10.4.1 General considerations

To respond to Resolution 2 (RRC-06) three alternatives have been identified.

All three methods permit the Member States that are not parties to the GE06 Agreement to continue to use the current forms of notice, without the need for re-adapting their data processing systems to new formats. The same also applies to the Member States from the planning area for the frequency bands that are outside of the scope of the GE06 Agreement.

7/7.1/10.4.2 Method A

Apart from the merger of Annexes 1A and 1B to RR Appendix **4**, this method follows the approach of the current version of RR Appendix **4** by incorporating new columns identifying the additional data elements required within the GE06 planning area.

Advantages:

– fulfils Resolution 2 (RRC-06);

– permits inconsistencies in the existing RR Appendix **4** data to be addressed;

– continues with the concept of identifying notification requirements based on the notice form;

– does not modify the current structure of the Annex 1B notice columns.

Disadvantages:

– the existing data and tabular structure of RR Appendix **4** is difficult to modify;

– requires the use of additional documentation to identify the data requirements;

– if new notice forms are developed it will be difficult to incorporate them into RR Appendix **4**, raising the possibility that information required for the application of RR Article **11** will not be maintained in a single list, e.g. the additional data requirements for HAPS;

– limits the advantages of migrating to electronic notices.

7/7.1/10.4.3 Method B

Method B rationalizes the columns used for individual services or stations into a single column (e.g. the merger of the columns listing VHF/UHF broadcasting) and groups common data elements. The resulting table is similar to the structure of RR Appendix **4** prior to WRC-2000.

Method B also includes the general characteristics to be provided for HAPS in Resolution **221**.

Advantages:

– fulfils Resolution 2 (RRC-06);

– permits the removal of data used for identifying notices that is not maintained in the RR and replaces it with a direct reference to the identity of the data required under each column and the service or application to which it applies, making it easier to identify the data requirements without the use of additional documentation;

– permits inconsistencies in the existing RR Appendix **4** data to be addressed;

– facilitates the move to electronic notices;

– the use of a structure similar to Annex 2 of RR Appendix **4**, facilitates the provision of assistance to countries in the shared bands.

Disadvantages:

– the structure represents a departure from the current version of Annex 1B of RR Appendix **4**.

7/7.1/10.4.4 Method C

Under this method, there will be no change to RR Appendix **4**. The current footnote (1) to Annex 1A of RR Appendix **4 (Rev.WRC-03)** specifies: "The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the International Frequency List". Following RRC-06, the Bureau developed such notices and included them in the Preface, with all necessary explanations. An additional footnote would be added to RR Appendix **4** to provide appropriate guidance to the Member States that are parties to the GE06 Agreement in this respect.

Advantages:

– retains the current flexibility for the Bureau to update the relevant forms of notice, if so decided by future conference, in a smooth manner, with a view to ensuring completeness, consistency and correctness of all inter-related data elements;

– RR Appendix **4** will not be too complicated.

Disadvantages:

– Member States that are parties to the GE06 Agreement will need to refer to another text (Preface) for the frequency bands that are governed by the GE06 Agreement. However, as the Preface is already cross-referenced in the footnote (1) of RR Appendix **4**, this is not a real disadvantage;

– data required for the application of RR Article **11** will no longer be listed in a single Appendix;

– limits the advantages of migrating to electronic notices.

7/7.1/10.5 Regulatory and procedural considerations

7/7.1/10.5.1 Method A

A possible regulatory procedure to implement Method A is to modify RR Appendix **4** in accordance with the example text shown in Annex 7.1.X.

7/7.1/10.5.2 Method B

A possible regulatory procedure to implement Method B is to modify RR Appendix **4** in accordance with the example text shown in Annex 7.1.Y.

7/7.1/10.5.3 Method C

A possible regulatory procedure to implement Method C:

– no change to Annex 1A and Annex 1B to RR Appendix **4 (Rev.WRC-03)**;

– add an additional footnote to Annex 1A, along the following lines: "(2) For the application of the procedures governed by the GE06 Agreement by the Member States that are parties to that Agreement, within the planning areas and the frequency bands specified in that Agreement, the electronic formats for submission of the required data elements are included in the Preface to the BR IFIC and to the International Frequency List."

Annex 7-1.X

Revision of Annexes 1A and 1B of RR Appendix 4

In the following proposals the first column in the table is a temporary column introduced to simplify referencing individual data items.

APPENDIX 4 (Rev.WRC-03)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

SUP

Annex 1A

List of characteristics of stations in the terrestrial services[8]

[8] The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the International Frequency List.

MOD

Annex 1~~B~~

Table of characteristics to be submitted for ~~stations~~frequency assignments or allotments in the terrestrial services[9] (WRC-2000)

	Notice type		T01	T02	T03	T04	GS2 GT2	GS1 GT1 GB1	G02	G11	T11	G12	T12			G13	T13		G14	T14	T15	T16	T17		AR21	Notice type
	Item No.		VHF Sound Broadcasting (BC) excluding stations covered by GS1, GS2, GB1 or G02	VHF/UHF Television Broadcasting (BT) excluding stations covered by GT1, GT2, GB1 or G02	LF/MF Sound Broadcasting R 1 & 3 (BC)	MF Sound Broadcasting R 2 (BC)	GE06 Digital Sound or Television Allotments [1]	GE06 Digital Sound or Television Assignments [1]	GE06 Analogue Assignments (during transition period only) [1]	GE06 Tx Station in the Fixed Service [1]	Tx Station in the Fixed Service (FX)	GE06 Tx Station (Excluding stations in the Fixed service or typical stations) [1]	Tx Station (AL, BC[1], FA, FB, FC, FD, FG, FL, FP, LR, NL, OE, RN, SM, SS) excluding stations covered by T01 - T04, GS1, GS2, GT1, GT2, GB1, G02, G11, T11, G14, T14 - T17	~~FD, FG, SM~~ [2]	~~NL~~ [2]	GE06 Rx Land Station [1]	Rx Land Station (AM, MA, ML, MO, MR, MS, NR, OD, RM, SA)	~~RM~~ [2]	GE06 Typical Tx Station [1]	Typical Tx Station (AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS)	Frequency Allotment in the Maritime Mobile Service (RR Ap 25) (FC[4])	Tx Station (Plan update Geneva, 1985) (AL[5], FC[5])	Tx Station Using Adaptive Systems (FA, FB, FC[2], FD[2], FG[2], FL, FP, FX)	~~FA, FB, FC², FD², FG², FL, FP~~ [2]	Article 12 HF Broadcasting (BC)	Item No.
1		GENERAL INFORMATION AND FREQUENCY CHARACTERISTICS																								
2	B	~~Notifying administration~~ the ~~S~~symbol of the notifying administration (see the Preface)	X	X	X	X	X	X	X	X	X	X	X	~~X~~	~~X~~	X	X	~~X~~	X	X	X	X	X	~~X~~	X	B
3	GE06	the provision code The code of the provision in the Radio Regulations or Regional Agreement under which the notice has been submitted					X	X	X	X		X				X			X							GE06

9 The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the International Frequency List.

	Notice type		T01	T02	T03	T04	GS2 GT2	GS1 GT1 GB1	G02	G11	T11	G12	T12			G13	T13		G14	T14	T15	T16	T17		AR21	Notice type
	Item No.		VHF Sound Broadcasting (BC) excluding stations covered by GS1, GS2, GB1 or G02	VHF/UHF Television Broadcasting (BT) excluding stations covered by GT1, GT2, GB1 or G02	LF/MF Sound Broadcasting R 1 & 3 (BC)	MF Sound Broadcasting R 2 (BC)	GE06 Digital Sound or Television Allotments [1]	GE06 Digital Sound or Television Assignments [1]	GE06 Analogue Assignments (during transition period only) [1]	GE06 Tx Station in the Fixed Service [1]	Tx Station in the Fixed Service (FX)	GE06 Tx Station (Excluding stations in the Fixed service or typical stations) [1]	Tx Station (AL, BC[1], FA, FB, FC, FD, FG, FL, FP, LR, NL, OE, RN, SM, SS) excluding stations covered by T01 - T04, GS1, GS2, GT1, GT2, GB1, G02, G11, T11, G14, T14 - T17	~~FD, FG, SM~~ [2]	~~NL~~ [2]	GE06 Rx Land Station [1]	Rx Land Station (AM, MA, ML, MO, MR, MS, NR, OD, RM, SA)	~~RM~~ [2]	GE06 Typical Tx Station [1]	Typical Tx Station (AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS)	Frequency Allotment in the Maritime Mobile Service (RR Ap 25) (FC[4])	Tx Station (Plan update Geneva, 1985) (AL[5], FC[5])	Tx Station Using Adaptive Systems (FA, FB, FC[2], FD[2], FG[2], FL, FP, FX)	~~FA, FB, FC², FD², FG², FL, FP~~ [2]	Article 12 HF Broadcasting (BC)	Item No.
4	GE06	if the notice is resubmitted, the provision code under which the notice has been resubmitted The code of the provision in the Regional Agreement under which the notice has been resubmitted					I	I	I	I		I				I			I							GE06
5	GE06	the intended action code for the notice [3] The action to be taken with respect to the notice (e.g. Add, Modify)					X	X	X	X	X	X	X			X	X		X	X			X			GE06

	Notice type		T01	T02	T03	T04	GS2 GT2	GS1 GT1 GB1	G02	G11	T11	G12	T12			G13	T13		G14	T14	T15	T16	T17		AR21	Notice type
	Item No.		VHF Sound Broadcasting (BC) excluding stations covered by GS1, GS2, GB1 or G02	VHF/UHF Television Broadcasting (BT) excluding stations covered by GT1, GT2, GB1 or G02	LF/MF Sound Broadcasting R 1 & 3 (BC)	MF Sound Broadcasting R 2 (BC)	GE06 Digital Sound or Television Allotments [1]	GE06 Digital Sound or Television Assignments [1]	GE06 Analogue Assignments (during transition period only) [1]	GE06 Tx Station in the Fixed Service [1]	Tx Station in the Fixed Service (FX)	GE06 Tx Station (Excluding stations in the Fixed service or typical stations) [1]	Tx Station (AL, BC[1], FA, FB, FC, FD, FG, FL, FP, LR, NL, OE, RN, SM, SS) excluding stations covered by T01 - T04, GS1, GS2, GT1, GT2, GB1, G02, G11, T11, G14, T14 - T17	~~FD, FG, SM~~ [2]	~~NL~~ [2]	GE06 Rx Land Station [1]	Rx Land Station (AM, MA, ML, MO, MR, MS, NR, OD, RM, SA)	~~RM~~ [2]	GE06 Typical Tx Station [1]	Typical Tx Station (AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS)	Frequency Allotment in the Maritime Mobile Service (RR Ap 25) (FC[4])	Tx Station (Plan update Geneva, 1985) (AL[5], FC[5])	Tx Station Using Adaptive Systems (FA, FB, FC[2], FD[2], FG[2], FL, FP, FX)	~~FA, FB, FC², FD², FG², FL, FP~~ [2]	Article 12 HF Broadcasting (BC)	Item No.
6	GE06	the request for publication Required only for requests by the notifying administration to apply the procedure in GE06/Art. 4 in the case of - GS1, GS2, GT1, GT2 or G02 under GE06/4.1.2.5 - G11, G12, G13 or G14 under GE06/4.2.2.4					+	+	+	+		+				+			+							GE06
7	GE06	the administration's unique identification code The unique identification code given by the administration to the allotment or assignment					X	X	X	X		X				X			X							GE06
8	GE06	if the assignment is linked to an allotment or converted from an allotment, the administration's unique identification code for that allotment						+																		GE06

	Notice type		T01	T02	T03	T04	GS2 GT2	GS1 GT1 GB1	G02	G11	T11	G12	T12			G13	T13		G14	T14	T15	T16	T17		AR21	Notice type
	Item No.		VHF Sound Broadcasting (BC) excluding stations covered by GS1, GS2, GB1 or G02	VHF/UHF Television Broadcasting (BT) excluding stations covered by GT1, GT2, GB1 or G02	LF/MF Sound Broadcasting R 1 & 3 (BC)	MF Sound Broadcasting R 2 (BC)	GE06 Digital Sound or Television Allotments [1]	GE06 Digital Sound or Television Assignments [1]	GE06 Analogue Assignments (during transition period only) [1]	GE06 Tx Station in the Fixed Service [1]	Tx Station in the Fixed Service (FX)	GE06 Tx Station (Excluding stations in the Fixed service or typical stations) [1]	Tx Station (AL, BC[1], FA, FB, FC, FD, FG, FL, FP, LR, NL, OE, RN, SM, SS) excluding stations covered by T01 - T04, GS1, GS2, GT1, GT2, GB1, G02, G11, T11, G14, T14 - T17	~~FD, FG, SM~~ [2]	~~NL~~ [2]	GE06 Rx Land Station [1]	Rx Land Station (AM, MA, ML, MO, MR, MS, NR, OD, RM, SA)	~~RM~~ [2]	GE06 Typical Tx Station [1]	Typical Tx Station (AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS)	Frequency Allotment in the Maritime Mobile Service (RR Ap 25) (FC[4])	Tx Station (Plan update Geneva, 1985) (AL[5], FC[5])	Tx Station Using Adaptive Systems (FA, FB, FC[2], FD[2], FG[2], FL, FP, FX)	~~FA, FB, FC[2], FD[2], FG[2], FL, FP~~ [2]	Article 12 HF Broadcasting (BC)	Item No.
9	GE06	if the notified assignment is to be operated under the mask of a digital broadcasting assignment in accordance with GE06/5.1.3, the administration's unique identification code of the relevant digital broadcasting assignment Not required for GS1 or GT1						+	+	+		+				+										GE06
10	GE06	the plan entry code The code identifying the category of plan entry to which the assignment or allotment belongs					X	X																		GE06
11	GE06	the assignment code The code identifying the type of assignment						X																		GE06

	Notice type		T01	T02	T03	T04	GS2 GT2	GS1 GT1 GB1	G02	G11	T11	G12	T12			G13	T13		G14	T14	T15	T16	T17		AR21	Notice type
	Item No.		VHF Sound Broadcasting (BC) excluding stations covered by GS1, GS2, GB1 or G02	VHF/UHF Television Broadcasting (BT) excluding stations covered by GT1, GT2, GB1 or G02	LF/MF Sound Broadcasting R 1 & 3 (BC)	MF Sound Broadcasting R 2 (BC)	GE06 Digital Sound or Television Allotments [1]	GE06 Digital Sound or Television Assignments [1]	GE06 Analogue Assignments (during transition period only) [1]	GE06 Tx Station in the Fixed Service [1]	Tx Station in the Fixed Service (FX)	GE06 Tx Station (Excluding stations in the Fixed service or typical stations) [1]	Tx Station (AL, BC[1], FA, FB, FC, FD, FG, FL, FP, LR, NL, OE, RN, SM, SS) excluding stations covered by T01 - T04, GS1, GS2, GT1, GT2, GB1, G02, G11, T11, G14, T14 - T17	~~FD, FG, SM~~ [2]	~~NL~~ [2]	GE06 Rx Land Station [1]	Rx Land Station (AM, MA, ML, MO, MR, MS, NR, OD, RM, SA)	~~RM~~ [2]	GE06 Typical Tx Station [1]	Typical Tx Station (AL[2], FA[3], FB[3], FC[2], FD[2], FG[2], FL, FP, FX[3], LR, NL[2], OE, RN, SM, SS)	Frequency Allotment in the Maritime Mobile Service (RR Ap 25) (FC[4])	Tx Station (Plan update Geneva, 1985) (AL[5], FC[5])	Tx Station Using Adaptive Systems (FA, FB, FC[2], FD[2], FG[2], FL, FP, FX)	~~FA, FB, FC², FD², FG², FL, FP~~ [2]	Article 12 HF Broadcasting (BC)	Item No.
12	SYNC	~~Synchronized network~~ if the station is operating within a synchronized network, the identification ~~S~~symbols ~~followed by the identification of the~~ for that synchronized network~~, if the station concerned by the assignment pertains to a synchronized network.~~			+	+	+	+																		SYNC

X Mandatory~~* One of the items~~ + Mandatory under specified condition~~Required in specific cases~~ O Optional

C – Mandatory if used as a basis to effect coordination with another administration

Annex 7-1.Y

Revision of Annexes 1A and 1B of RR Appendix 4

In the following proposals the first column in the table is a temporary column introduced to simplify referencing individual data items.

APPENDIX 4 (Rev.WRC-03)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

SUP

Annex 1A

List of characteristics of stations in the terrestrial services[10]

SUP

Annex 1B

Table of characteristics to be submitted for stations in the terrestrial services (WRC-2000)

[10] The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the International Frequency List.

ADD

Annex 1

Characteristics of stations in the terrestrial services

Reading the Appendix 4 Table

The rules used to link the sign with the text are based on the Table column headings covering specific procedures and specific services.

1 If any data item has a condition attached to it, then it has a "+".

1.5.3	GE06	if a digital assignment is linked to an allotment or converted from an allotment, within the GE06 Plan, the administration's unique identification code for that allotment	+

2 A subheading limits the range of procedures, services or frequency bands applicable under a Table column heading. Unless further specific conditions apply, the data items grouped under that sub-heading have a "X" as the conditional nature is shown in the subheading title.

1.5		**For assignments and allotments subject to the GE06 Regional Agreement:**	

1.5.6	GE06	the digital broadcasting assignment code	X

Table of characteristics to be submitted for frequency assignments or allotments in the terrestrial services[11]

Column 1	Item No.	Notice Type	VHF and UHF Broadcasting (Sound & Television) Stations up to 960 MHz: Article 11 and, if applicable, plan modification (ST61, GE84, GE89 & GE06 Regional Agreements)	LF and MF Broadcasting (Sound) Stations: Article 11 and plan modification (GE75 & Rio 81 Regional Agreements)	VHF and UHF Broadcasting (Sound & Television) Allotments: plan modification (GE06 Regional Agreement)	Transmitting Stations (except Broadcasting stations in the planned LF & MF bands, HF in the bands governed by Article 12, the VHF & UHF bands up to 960 MHz): Article 11 and, if applicable, Article 9, GE85EMA and GE06 Regional Agreements	Receiving Land Stations: Article 11 and, if applicable, Article 9 and GE06 Regional Agreement	Typical Transmitting Station: Article 11 and, if applicable, GE06 Regional Agreement	Maritime Mobile Frequency Allotment: plan modification (RR Appendix 25)	Aeronautical Radionavigation and Maritime Mobile Stations: plan modification (GE85M Regional Agreement)	High Altitude Platform Stations: Article 11	HF Broadcasting Stations: Article 12	Item No.
1		**GENERAL INFORMATION AND FREQUENCY CHARACTERISTICS**											
1.1	**B**	the symbol of the notifying administration (see the Preface)	X	X	X	X	X	X	X	X	X	X	**B**
1.2	**GE06**	the provision code of the Radio Regulations or Regional Agreement under which the notice has been submitted	X	X	X	X	X	X	X	X	X		**GE06**
1.3	**GE06**	the intended action code for the notice [3] The action to be taken with respect to the notice (e.g. Add, Modify)	X	X	X	X	X	X	X	X	X		**GE06**
1.4	**GE06**	the resubmission indicator Required only in application of Article **11** when a notice is resubmitted, for a: - VHF and UHF Broadcasting Station or Typical Transmitting Station, subject to the GE06 Regional Agreement - Transmitting Station or Receiving Land Station, subject to the GE06 Regional Agreement or Nos. **9.16**, **9.18** or **9.19**	+			+	+	+					

[11] The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the International Frequency List.

Column 1	Item No.	Notice Type	VHF and UHF Broadcasting (Sound & Television) Stations up to 960 MHz: Article 11 and, if applicable, plan modification (ST61, GE84, GE89 & GE06 Regional Agreements)	LF and MF Broadcasting (Sound) Stations: Article 11 and plan modification (GE75 & Rio 81 Regional Agreements)	VHF and UHF Broadcasting (Sound & Television) Allotments: plan modification (GE06 Regional Agreement)	Transmitting Stations (except Broadcasting stations in the planned LF & MF bands, HF in the bands governed by Article 12, the VHF & UHF bands up to 960 MHz): Article 11 and, if applicable, Article 9, GE85EMA and GE06 Regional Agreements	Receiving Land Stations: Article 11 and, if applicable, Article 9 and GE06 Regional Agreement	Typical Transmitting Station: Article 11 and, if applicable, GE06 Regional Agreement	Maritime Mobile Frequency Allotment: plan modification (RR Appendix 25)	Aeronautical Radionavigation and Maritime Mobile Stations: plan modification (GE85M Regional Agreement)	High Altitude Platform Stations: Article 11	HF Broadcasting Stations: Article 12	Item No.
1.5		**For assignments and allotments subject to the Geneva 06 Regional Agreement**											
1.5.1	GE06	the request for publication Required only in application of Article 4 of the GE06 Regional Agreement, when the notifying administration requests to complete the modification/coordination procedure, for a: - VHF and UHF Broadcasting Station or VHF and UHF Broadcasting Allotment, under §4.1.2.5 - Transmitting Station, Receiving Land Station or Typical Transmitting Station, under §4.2.2.4	+		+	+	+	+					GE06
1.5.2	GE06	the administration’s unique identification code for the assignment or allotment	X		X	X	X	X					GE06
1.5.3	GE06	if a digital assignment is linked to an allotment or converted from an allotment, within the GE06 Plan, the administration’s unique identification code for that allotment	+										GE06
1.5.4	GE06	if the notified assignment is to be operated under the mask of a digital broadcasting entry in accordance with §5.1.3, the administration’s unique identification code of the relevant digital broadcasting entry	+			+	+						GE06
1.5.5	GE06	the digital broadcasting plan entry code that identifies the category of plan entry to which the assignment or allotment belongs	X		X								GE06
1.5.6	GE06	the digital broadcasting assignment code	X										GE06

Column 1	Item No.	Notice Type	VHF and UHF Broadcasting (Sound & Television) Stations up to 960 MHz: Article 11 and, if applicable, plan modification (ST61, GE84, GE89 & GE06 Regional Agreements)	LF and MF Broadcasting (Sound) Stations: Article 11 and plan modification (GE75 & Rio 81 Regional Agreements)	VHF and UHF Broadcasting (Sound & Television) Allotments: plan modification (GE06 Regional Agreement)	Transmitting Stations (except Broadcasting stations in the planned LF & MF bands, HF in the bands governed by Article 12, the VHF & UHF bands up to 960 MHz): Article 11 and, if applicable, Article 9, GE85EMA and GE06 Regional Agreements	Receiving Land Stations: Article 11 and, if applicable, Article 9 and GE06 Regional Agreement	Typical Transmitting Station: Article 11 and, if applicable, GE06 Regional Agreement	Maritime Mobile Frequency Allotment: plan modification (RR Appendix 25)	Aeronautical Radionavigation and Maritime Mobile Stations: plan modification (GE85M Regional Agreement)	High Altitude Platform Stations: Article 11	HF Broadcasting Stations: Article 12	Item No.
1.6	**SYN C**	the identification symbols for the synchronised network Required only when an assignment or allotment is operating within a synchronized network for a: - VHF/UHF Broadcasting Station operating a digital assignment subject to the GE06 Regional Agreement - LF and MF Broadcasting Station - VHF/UHF Broadcasting Allotment	+	+	+								**SYN C**
1.7		**The Assigned Frequency, Assigned Channel or Frequency Band**											
1.7.1	**1A**	the assigned frequency as defined in Article **1**	X	X	X	X	X	X		X	X	[4]	**1A**
1.7.2	**1G**	the alternative frequency										O	**1G**
1.7.3	**1B**	the reference frequency as defined in Article **1** In the case of a Transmitting Station, Receiving Land Station, Typical Transmitting Station or a GE85M Plan update, required only for assignments where the first letter of the class of emission is C, H, J or R				+	+	+		+		X [4]	**1B**
1.7.4	**1X**	the channel number of the proposed or allotted channel In the case of Maritime Mobile Frequency Allotment, required only for notices in accordance with AP25/1.1.1, /1.1.2, /1.25							+[6]	O			**1X**
1.7.5	**1Y**	the channel number of the alternative proposed channel							O				**1Y**

X - Mandatory information; + - Mandatory under specified conditions; O - Optional information; C - Mandatory if used as a basis to effect coordination with another administration

Agenda item 7.2

"to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, taking into account Resolution 803 (WRC-03)"

7/7.2/1 Preliminary agenda items for WRC-11

See Resolution **803 (WRC-03)** and Documents CPM07-2/35 (Annex 2 to Attachment 3), 44 and 65 + Add. 7.

7/7.2/2 Items for inclusion in the agendas of future conferences

See Resolution **803 (WRC-03)**, *resolves* 3.

7/7.2/3 Additional suggested items

Suggestions for items that may be proposed for inclusion on the agenda for World Radiocommunication Conference (WRC-11) were submitted to CPM and noted (Documents CPM-07-2/4, 5+5(Corr.1), 6 (Sections 6 and 7), 35 (Section 2 items 5 to 10) and 52.

Regional Organizations and Administrations are still in the process of preparing for WRC-07. It is expected that this process would take into account the principles of Recommendation 800 (WRC-03).

7/7.2/4 Consideration of Recommendation 800 (WRC-03)

Two views have been expressed (with or without modification):

View 1: Not to upgrade Recommendation **800 (WRC-03)** to a WRC Resolution.

View 2: To upgrade Recommendation **800 (WRC-03)** to a WRC Resolution.

Annex

TO THE CPM REPORT

Reference List of ITU-R Resolutions, Recommendation and Reports, as well as other ITU publications, used in the CPM Report

1 List of Draft new ITU-R Resolutions

ITU-R Series	Resolution Draft Number	Available Document / Status	Resolution Title	Agenda Item	CPM Chapter
M.	[IMT.NAME]	Draft new Res. ITU-R [IMT.NAME] (Doc. 8/1004, Annex 1 (Rev.1))	Naming for International Mobile Telecommunications	1.4	1

2 List of existing ITU-R Recommendations

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
F.	240	Rec. ITU-R F.240-7	Signal-to-interference protection ratios for various classes of emission in the fixed service below about 30 MHz	1.13	5
F.	339	Rec. ITU-R F.339-7	Bandwidths, signal-to-noise ratios and fading allowances in complete systems	1.13	5

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
F.	384	Rec. ITU-R F.384-9	Radio-frequency channel arrangements for medium and high capacity digital fixed wireless systems operating in the upper 6 GHz band	1.5	1
BT.	417	Rec. ITU-R BT.417-5	Minimum field strengths for which protection may be sought in planning an analogue television service	1.11	3
BT.	419	Rec. ITU-R BT.419-3	Directivity and polarization discrimination of antennas in the reception of television broadcasting	1.11	3
P.	452-12	Rec. ITU-R P.452-12	Prediction procedure for the evaluation of microwave interference between stations on the surface of the Earth at frequencies above about 0.7 GHz	1.5 1.2	1 2
S.	465-5	Rec. ITU-R S.465-5	Reference earth-station radiation pattern for use in coordination and interference assessment in the frequency range from 2 to about 30 GHz	1.5 1.20	1 2
M.	489-2	Rec. ITU-R M.489-2	Technical characteristics of VHF radiotelephone equipment operating in the maritime mobile service in channels spaced by 25 kHz	1.14	5
M.	493-11	Draft revision of Rec. ITU-R M.493-11 (Doc. 8/BL/39)	Digital selective-calling system for use in the maritime mobile service	1.14	5
SA.	509	Rec. ITU-R SA.509	Space research earth station and radio astronomy reference antenna radiation pattern for use in interference calculations, including coordination procedures	1.5	1

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
RS.	515-4	Rec. ITU-R RS.515-4	Frequency bands and bandwidths used for satellite passive sensing	1.2	2
RA.	517-4	Rec. ITU-R RA.517-4	Protection of the radio astronomy service from transmitters operating in adjacent bands	1.21	2
S.	524-7	Rec. ITU-R S.524-9	Maximum permissible levels of off-axis e.i.r.p. density from earth stations in geostationary-satellite orbit networks operating in the fixed-satellite service transmitting in the 6 GHz, 13 GHz, 14 GHz and 30 GHz frequency bands	1.5	1
P.	525-2	Rec. ITU-R P.525-2	Calculation of free-space attenuation	1.6	1
P.	526-9	Rec. ITU-R P.526-9(Rev.)	Propagation by diffraction	1.6 1.2	1 2
M.	541-9	Rec. ITU-R M.541-9	Operational procedures for the use of digital selective-calling equipment in the maritime mobile service	1.14	5
S.	580-6	Rec. ITU-R S.580-6	Radiation diagrams for use as design objectives for antennas of earth stations operating with geostationary satellites	1.2	2
M.	585	Draft revision of Rec. ITU-R M.585-3 (Doc. 8/156R1)	Assignment and use of maritime mobile service identities	1.14,1.16	5
P.	618-8	Rec. ITU-R P.618-8	Propagation data and prediction methods required for the design of Earth-space telecommunication systems	1.10	6
S.	672-4	Rec. ITU-R S.672-4	Satellite antenna radiation pattern for use as a design objective in the fixed-satellite service employing geostationary satellites	1.18	4

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
P.	676-6	Rec. ITU-R P.676-6(Rev.)	Attenuation by atmospheric gases	1.18 1.10	4 6
F.	699-7	Rec. ITU-R F.699-7	Reference radiation patterns for fixed wireless system antennas for use in coordination studies and interference assessment in the frequency range from 100 MHz to about 70 GHz	1.2 1.11	2 3
BS.	705-1	Rec. ITU-R BS.705-1	HF transmitting and receiving antennas characteristics and diagrams	1.13	5
F.	758-4	Rec. ITU-R F.758-4	Considerations in the development of criteria for sharing between the terrestrial fixed service and other services	1.5 1.2 1.11	1 2 3
RA.	769	Rec. ITU-R RA.769-2	Protection criteria used for radio astronomical measurements	1.5 1.21 1.7, 1.17 1.8	1 2 3 4
BT.	798	Rec. ITU-R BT.798-1	Digital television terrestrial broadcasting in the VHF/UHF bands	1.11	3
M.	818-2	Rec. ITU-R M.818-2	Satellite operation within International Mobile Telecommunications-2000 (IMT-2000)	1.4	1
M.	819-2	Rec. ITU-R M.819-2	International Mobile Telecommunications-2000 (IMT-2000) for developing countries	1.4	1
M.	822-1	Rec. ITU-R M.822-1	Calling-channel loading for digital selective calling (DSC) for the maritime mobile service	1.14	5
P.	833-5	Rec. ITU-R P.833-5(Rev.)	Attenuation in vegetation	1.2	2
P.	837	Rec. ITU-R P.837-4	Characteristics of precipitation for propagation modelling	1.10	6

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
SF.	1006	Rec. ITU-R SF.1006	Determination of the interference potential between earth stations of the fixed-satellite service and stations in the fixed service	1.5 1.11	1 1
RS.	1028-2	Rec. ITU-R RS.1028-2	Performance criteria for satellite passive remote sensing	1.2	2
RS.	1029-2	Rec. ITU-R RS.1029-2	Interference criteria for satellite passive remote sensing	1.2, 1.20 1.17	2 3
M.	1036	Rec. ITU-R M.1036-2	Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications-2000 (IMT-2000) in the bands 806-960 MHz, 1 710-2 025 MHz, 2 110-2 200 MHz and 2 500-2 690 MHz	1.4 1.9	1 3
M.	1037	Rec. ITU-R M.1037	Bit error performance objectives for aeronautical mobile-satellite (R) service (AMS(R)S) radio link	1.6	1
M.	1040	Rec. ITU-R M.1040	Public mobile telecommunication service with aircraft using the bands 1 670-1 675 MHz and 1 800-1 805 MHz	1.7	3
M.	1042	Rec. ITU-R M.1042-2	Disaster communications in the amateur and amateur-satellite services	1.13	5
M.	1044-2	Rec. ITU-R M.1044-2	Frequency sharing criteria in the amateur and amateur-satellite services	1.15	5
M.	1084-4	Rec. ITU-R M.1084-4	Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service	1.14	5

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1089-1	Rec. ITU-R M.1089-1	Technical considerations for the coordination of mobile-satellite systems relating to the aeronautical mobile satellite (R) service (AMS(R)S) in the bands 1 545 to 1 555 MHz and 1 646.5 to 1 656.5 MHz	1.6	1
F.	1107-1	Rec. ITU-R F.1107-1	Probabilistic analysis for calculating interference into the fixed service from satellites occupying the geostationary orbit	1.2 1.11	2 3
F.	1108	Rec. ITU-R F.1108-4	Determination of the criteria to protect fixed service receivers from the emissions of space stations operating in non-geostationary orbits in shared frequency bands	1.5 1.11,1.17	1 3
F.	1110	Rec. ITU-R F.1110-3	Adaptive radio systems for frequencies below about 30 MHz	1.13	5
BT.	1123	Rec. ITU-R BT.1123	Planning methods for 625-line terrestrial television in VHF/UHF bands	1.11	3
BT.	1125	Rec. ITU-R BT.1125	Basic objectives for the planning and implementation of digital terrestrial television broadcasting systems	1.11	3
RS.	1166-3	Rec. ITU-R RS.1166-3	Performance and interference criteria for active spaceborne sensors	1.3	1
M.	1167	Rec. ITU-R M.1167	Framework for the satellite component of International Mobile Telecommunications-2000 (IMT-2000)	1.4	1
M.	1171	Rec. ITU-R M.1171	Radiotelephony procedures in the maritime mobile service	1.14	5

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1172	Rec. ITU-R M.1172	Miscellaneous abbreviations and signals to be used for radiocommunications in the maritime mobile service	1.14	5
M.	1180	Rec. ITU-R M.1180	Availability of communication circuits in the aeronautical mobile-satellite (R) services (AMS(R)S)	1.6	1
M.	1184-2	Rec. ITU-R M.1184-2	Technical characteristics of mobile satellite systems in the frequency bands below 3 GHz for use in developing criteria for sharing between the mobile-satellite service (MSS) and other services	1.6 1.21	1 2
BT.	1206	Rec. ITU-R BT.1206	Spectrum shaping limits for digital terrestrial television broadcasting	1.11	3
M.	1229	Rec. ITU-R M.1229	Performance objectives for the digital aeronautical mobile-satellite service (AMSS) channels operating in the bands 1 525 to 1 559 MHz and 1 626.5 to 1 660.5 MHz not forming part of the ISDN	1.6	1
M.	1233-1	Rec. ITU-R M.1233-1	Technical considerations for sharing satellite network resources between the mobile-satellite service (MSS) (other than the aeronautical mobile-satellite (R) service (AMS(R)S)) and AMS(R)S	1.6	1
M.	1234-1	Rec. ITU-R M.1234-1	Permissible level of interference in a digital channel of a geostationary satellite network in the aeronautical mobile-satellite (R) service (AMS(R)S) in the bands 1 545 to 1 555 MHz and 1 646.5 to 1 656.5 MHz and its associated feeder links caused by other networks of this service and the fixed-satellite service	1.6	1

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
SA.	1236	Rec. ITU-R SA.1236	Frequency sharing between space research service extra-vehicular activity (EVA) links and fixed and mobile service links in the 410-420 MHz band	1.4	1
F.	1245	Rec. ITU-R F.1245-1	Mathematical model of average radiation patterns for line-of-sight point-to-point radio-relay system antennas for use in certain coordination studies and interference assessment in the frequency range from 1 GHz to about 70 GHz	1.5 1.18	1 4
RS.	1260-1	Rec. ITU-R RS.1260-1	Feasibility of sharing between active spaceborne sensors and other services in the range 420-470 MHz	1.4	1
SM.	1266	Rec. ITU-R SM.1266	Adaptive MF/HF systems	1.13	5
RS.	1280	Rec. ITU-R RS.1280	Selection of active spaceborne sensor emission characteristics to mitigate the potential for interference to terrestrial radars operating in frequency bands 1-10 GHz	1.3	1
M.	1313	Rec. ITU-R M.1313-1	Technical characteristics of maritime radionavigation radars	1.3	1
SF.	1320	Rec. ITU-R SF.1320	Maximum allowable values of power flux-density at the surface of the Earth produced by non-geostationary satellites in the fixed-satellite service used in feeder links for the mobile-satellite service and sharing the same frequency bands with radio-relay systems	1.5	1

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
S.	1328	Rec. ITU-R S.1328-4	Satellite system characteristics to be considered in frequency sharing analyses within the fixed-satellite service	1.5 1.2 1.18	1 2 4
F.	1334	Rec. ITU-R F.1334	Protection criteria for systems in the fixed service sharing the same frequency bands in the 1 to 3 GHz range with the land mobile service	1.4	1
F.	1336-1	Draft revision of Rec. ITU-R F.1336-1 (Doc. 9/BL/23)	Reference radiation patterns of omnidirectional, sectoral and other antennas in point-to-multipoint systems for use in sharing studies in the frequency range from 1 GHz to about 70 GHz	1.5 1.9	1 3
BT.	1368	Rec. ITU-R BT.1368-6	Planning criteria for digital terrestrial television services in the VHF/UHF bands	1.11	3
M.	1371-2	Draft revision of Rec. ITU-R M.1371-2 (Doc. 8/178R1)	Technical characteristics for a universal ship borne automatic identification system using time division multiple access in the VHF maritime mobile band	1.14	5
M.	1372-1	Rec. ITU-R M.1372-1	Efficient use of the radio spectrum by radar stations in the radiodetermination service	1.3	1
M.	1391-1	Rec. ITU-R M.1391-1	Methodology for the calculation of IMT-2000 satellite spectrum requirements	1.4	1
SF.	1395	Rec. ITU-R SF.1395	Minimum propagation attenuation due to atmospheric gases for use in frequency sharing studies between the fixed-satellite service and the fixed service	1.18	4

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
S.	1432	Rec. ITU-R S.1432-1	Apportionment of the allowable error performance degradations to fixed-satellite service (FSS) hypothetical reference digital paths arising from time invariant interference for systems operating below 30 GHz	1.5 1.10	1 6
M.	1457-5	Rec. ITU-R M.1457-5	Detailed specifications of the radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)	1.4	1
M.	1459	Rec. ITU-R M.1459	Protection criteria for telemetry systems in the aeronautical mobile service and mitigation techniques to facilitate sharing with geostationary broadcasting-satellite and mobile-satellite services in the frequency bands 1 452-1 525 MHz and 2 310-2 360 MHz	1.5 1.17	1 3
M.	1461-1	Rec. ITU-R M.1461-1	Procedures for determining the potential for interference between radars operating in the radiodetermination service and systems in other services	1.3 1.4	1
M.	1463	Draft revision of Rec. ITU-R M.1463 (Doc. 8/172(Rev.1))	Characteristics of and protection criteria for radars operating in the radiodetermination service in the frequency band 1 215-1 400 MHz	1.17	3
M.	1464-1	Rec. ITU-R M.1464-1	Characteristics of radiolocation radars, and characteristics and protection criteria for sharing studies for aeronautical radionavigation and meteorological radars in the radiodetermination service operating in the frequency band 2 700-2 900 MHz	1.4	1

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1465	Draft revision of Rec. ITU-R M.1465 (Doc. 8/173(Rev.1))	Characteristics of and protection criteria for radars operating in the radiodetermination service in the frequency band 3 100-3 700 MHz	1.4	1
SF.	1481-1	Rec. ITU-R SF.1481-1	Frequency sharing between systems in the fixed service using high-altitude platform stations and satellite systems in the geostationary orbit in the fixed-satellite service in the bands 47.2-47.5 and 47.9-48.2 GHz	1.8	4
SF.	1483	Rec. ITU-R SF.1483	Maximum allowable values of power flux-density (pfd) produced at the Earth's surface by non-GSO satellites in the fixed-satellite service (FSS) operating in the 17.7-19.3 GHz band	1.18	4
F.	1494	Rec. ITU-R F.1494	Interference criteria to protect the fixed service from time varying aggregate interference from other services sharing the 10.7-12.75 GHz band on a co-primary basis	1.5	1
F.	1495	Rec. ITU-R F.1495	Interference criteria to protect the fixed service from time varying aggregate interference from other services sharing the 17.7-19.3 GHz band on a co-primary basis	1.18	4
F.	1500	Rec. ITU-R F.1500	Preferred characteristics of systems in the fixed service using high altitude platforms operating in the bands 47.2-47.5 GHz and 47.9-48.2 GHz	1.8	4
F.	1501	Rec. ITU-R F.1501	Coordination distance for systems in the fixed service (FS) involving high-altitude platform stations (HAPSS) sharing the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz with other systems in the fixed service	1.8	4

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
P.	1511	Rec. ITU-R P.1511	Topography for Earth-to-space propagation modelling	1.18	4
RA.	1513-1	Rec. ITU-R RA.1513-1	Levels of data loss to radio astronomy observations and percentage-of-time criteria resulting from degradation by interference for frequency bands allocated to the radio astronomy on a primary basis	1.21 1.7, 1.17	2 3
BS.	1514-1	Rec. ITU-R BS.1514-1	System for digital sound broadcasting in the broadcasting bands below 30 MHz	1.13	5
S.	1528	Rec. ITU-R S.1528	Satellite antenna radiation patterns for non-geostationary orbit satellite antennas operating in the fixed-satellite service below 30 GHz	1.18	4
SM.	1541-2	Rec. ITU-R SM.1541-2	Unwanted emissions in the out-of-band domain	1.20	2
P.	1546	Rec. ITU-R P.1546-2	Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3 000 MHz	1.11	3
F.	1568-1	Rec. ITU-R F.1568-1	Radio-frequency block arrangements for fixed wireless access systems in the range 10.15-10.3/10.5-10.65 GHz	1.2	2
F.	1570-1	Rec. ITU-R F.1570-1	Impact of uplink transmission in the fixed service using high altitude platform stations on the Earth exploration-satellite service (passive) in the 31.3-31.8 GHz band	1.8	4

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
SF.	1572	Rec. ITU-R SF.1572	Methodology to evaluate the impact of space-to-Earth interference from the fixed-satellite service to the fixed service in frequency bands where precipitation is the predominant fade mechanism	1.18	4
M.	1583	Rec. ITU-R M.1583	Interference calculations between non-GSO MSS or RNSS satellite systems and radio astronomy telescope sites	1.21	2
S.	1586	Rec. ITU-R S.1586-1	Calculation of unwanted emission levels produced by a non-geostationary fixed-satellite service system at radio astronomy sites	1.17	3
SF.	1601-1	Rec. ITU-R SF.1601-1	Methodologies for interference evaluation from the downlink of the fixed service using high altitude platform stations to the uplink of the fixed-satellite service using the geostationary satellites within the band 27.5-28.35 GHz	1.8	4
SF.	1602	Rec. ITU-R SF.1602	Methodology for determining power flux-density statistics for use in sharing studies between fixed wireless systems and multiple fixed-satellite service satellites	1.11 1.18	3 4
F.	1607	Rec. ITU-R F.1607	Interference mitigation techniques for use by high altitude platform stations (HAPS) in the 27.5-28.35 GHz and 31.0-31.3 GHz bands	1.8	4

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
F.	1609-1	Rec. ITU-R F.1609-1	Interference evaluation from fixed service systems using high altitude platform stations to conventional fixed service systems in the bands 27.5-28.35 and 31.0-31.3 GHz	1.8	4
F.	1612	Rec. ITU-R F.1612	Interference evaluation of the fixed service using high altitude platform stations to protect the radio astronomy service from uplink transmission in high altitude platform station systems in the 31.3-31.8 GHz band	1.8	4
BS.	1615	Rec. ITU-R BS.1615	"Planning parameters" for digital sound broadcasting at frequencies below 30 MHz	1.13	5
RA.	1631	Rec. ITU-R RA.1631	Reference radio astronomy antenna pattern to be used for compatibility analyses between non-GSO systems and radio astronomy service stations based on the epfd concept	1.21 1.17	2 3
SM.	1633	Rec. ITU-R SM.1633	Compatibility analysis between a passive service and an active service allocated in adjacent and nearby bands	1.20,1.21	2
M.	1643	Rec. ITU-R M.1643	Technical and operational requirements for aircraft earth stations of aeronautical mobile-satellite service including those using fixed-satellite service network transponders in the band 14-14.5 GHz (Earth-to-space)	1.6	1

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
M.	1645	Rec. ITU-R M.1645	Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000	1.4 1.9	1 3
M.	1646	Rec. ITU-R M.1646	Parameters to be used in co-frequency sharing and pfd threshold studies between terrestrial IMT-2000 and BSS (sound) in the 2630-2655 MHz band	1.9	3
SF.	1650	Rec. ITU-R SF.1650-1	The minimum distance from the baseline beyond which in-motion earth stations located on board vessels would not cause unacceptable interference to the terrestrial service in the bands 5 925-6 425 MHz and 14-14.5 GHz	1.5	1
M.	1652	Rec. ITU-R M.1652	Dynamic frequency selection (DFS) in wireless access systems (WAS) including radio local area networks (RLAN) for the purpose of protecting the radiodetermination service in the 5 GHz band	1.5	1
BO.	1659	Rec. ITU-R BO.1659	Mitigation techniques for rain attenuation for broadcasting satellite-service systems in frequency bands between 17.3 GHz and 42.5 GHz	7.1 Issue E	7
F.	1670-1	Rec. ITU-R F.1670-1	Protection of fixed wireless systems from terrestrial digital video broadcasting systems in the VHF and UHF shared bands	1.11	3
S.	1709	Rec. ITU-R S.1709-1	Technical characteristics of air interfaces for global broadband satellite systems	1.19	4
S.	1711	Rec. ITU-R S.1711	Performance enhancements of transmission control protocol over satellite networks	1.19	4

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
BO.	1724	Rec. ITU-R BO.1724	Interactive satellite broadcasting systems (television, sound and data)	1.19	4
M.	1732	Rec. ITU-R M.1732	Characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies	1.13	5
M.	1739	Rec. ITU-R M.1739	Protection criteria for wireless access systems, including radio local area networks, operating in the mobile service in accordance with Resolution 229 (WRC-03) in the bands 5 150-5 250 MHz, 5 250-5 350 MHz and 5 470-5 725 MHz	1.5	1
S.	1758	Rec. ITU-R S.1758	Characterization of HEO-type systems in the fixed-satellite service	1.18	4
F.	1761	Rec. ITU-R F.1761	Characteristics of HF fixed radiocommunication systems	1.13	5
F.	1762	Rec. ITU-R F.1762	Characteristics of enhanced applications high frequency (HF) radiocommunication systems	1.13	5
F.	1763	Rec. ITU-R F.1763	Radio interface standards for broadband wireless access systems in the fixed service operating below 66 GHz	1.9	3
M.	1768	Rec. ITU-R M.1768	Methodology for calculation of spectrum requirements for the future development of the terrestrial component of IMT-2000 and systems beyond IMT-2000	1.4	1
BO.	1776	Rec. ITU-R BO.1776	Reference power flux-density for the broadcasting satellite-service in the band 21.4-22.0 GHz in Regions 1 and 3	7.1 Issue E	7

ITU-R Series	Recommendation Number	Latest Publication	Recommendation Title	Agenda Item	CPM Chapter
F.	1777	Rec. ITU-R F.1777	System characteristics for use in sharing studies with television outside broadcast (TVOB), electronic news gathering (ENG) and electronic field production (EFP) in the fixed service	1.9	3
F.	1778	Rec. ITU-R F.1778	Channel access requirements for HF adaptive systems in the fixed service	1.13	5
S.	[FSS/BSS]	Rec. ITU-R S.1780	Coordination between geostationary-satellite orbit fixed-satellite service networks and broadcasting-satellite service networks in the band 17.3-17.8 GHz	1.12	6
S.	[BBIAS]	Rec. ITU-R S.1782	Possibilities for global broadband internet access by FSS systems	1.19	4
S.	1783	Rec. ITU-R S.1783	Technical and operational features characterizing high-density applications in the fixed-satellite service (HDFSS)	1.19 7.1 Issue G	4 7

3 List of preliminary draft new or draft new ITU-R Recommendations

ITU-R Series	Recommendation Draft Number	Available Document / Status	Recommendation Title	Agenda Item	CPM Chapter
BO.	[Doc. 6/310]	Draft new Rec. ITU-R BO.[Doc.6/310] (Doc. 6/310 (Rev.1))	Intra-service sharing criteria for GSO BSS systems in the band 21.4-22.0 GHz in Regions 1 and 3	7.1 Issue E	7
F.	[9D/219 ANNEX 6]	Working document towards preliminary draft new Rec. ITU-R F.[9D/219 ANNEX 6] (Doc. 9D/219 Annex 6)	Technical and operational characteristics of systems in the fixed service to facilitate sharing with the Earth exploration-satellite (passive) and space research (passive) services in the band 10.6-10.68 GHz	1.2	2
M.	[8/167]	Draft new Rec. ITU-R M.[8A/BWA] (Doc. 8/167(Rev.1))	Radio interface standards for broadband wireless access systems, including mobile and nomadic applications, in the mobile service operating below 6 GHz	1.5	1
M.	[8A/LMS.CHAR.HF]	Draft new Rec. ITU-R M.[8A/LMS.CHAR.HF] (Doc. 8/BL/37)	Technical and operational characteristics of land mobile MF/HF systems	1.13	5
M.	[8B.8-10 GHz]	Draft new Rec. ITU-R M.[8B.8-10 GHz] (Doc. 8/BL/38)	Characteristics of and protection criteria for radars operating in the radiodetermination service in the frequency band 8.5-10.5 GHz	1.3	1
M.	[8B/441 Annex 10]	Preliminary draft new Rec. ITU-R M.[8B/441 Annex 10] (Doc. 8B/441 Annex 10)	Technical characteristics and protection criteria of aeronautical radionavigation service systems in 645-862 MHz frequency band	1.11	3

ITU-R Series	Recommendation Draft Number	Available Document / Status	Recommendation Title	Agenda Item	CPM Chapter
M.	[AM(R)S/AS 5 091-5 150]	Preliminary draft new Rec. ITU-R M.[AM(R)S/AS 5 091-5 150] (Doc. 8B/559 Annex 7)	Technical and operational requirements for stations of aeronautical mobile (R) service limited to surface application at airports and for stations of aeronautical mobile service limited to aeronautical security (AS) applications in the band 5 091-5 150 MHz	1.6	1
M.	[AMS-MLS]	Preliminary draft new Rec. ITU-R M.[AMS-MLS] (Doc. 8B/559 Annex 2)	Method for determining [coordination] distances, in the 5 GHz band, between the international standard microwave landing system (MLS) stations operating in the aeronautical radionavigation service and transmitters operating in the aeronautical mobile service (AMS) to support telemetry	1.6	1
M.	[AMT 5 030-5 250 MHz]	Preliminary draft new Rec. ITU-R M.[AMT 5 030-5 250 MHz] (Doc. 8B/559 Annex 1)	Technical and operational requirements for aircraft stations of aeronautical mobile service limited to transmissions of telemetry for flight testing in the band 5 030-5 250 MHz	1.5	1
M.	[HF-DATA]	Preliminary draft new Rec. ITU-R M.[HF-DATA] (Doc 8/161(Rev.1))	Characteristics of HF radio equipment for the exchange of digital data and electronic mail in the maritime mobile service	1.13	5
M.	[LMS.Char.cell]	Preliminary draft new Rec. ITU-R M.[LMS.CHAR.CELL] (Doc. 8A/468 Annex 9)	Technical and operational characteristics of digital cellular land mobile systems to be used in sharing studies	1.11	3
M.	[LMS.Char.VHF-UHF]	Preliminary draft new Rec. ITU-R M.[LMS.CHAR.VHF-UHF] (Doc. 8/168(Rev.1))	Technical and operational characteristics of conventional and trunked land mobile systems operating in the mobile service allocations below 960 MHz to be used in sharing studies	1.11	3

ITU-R Series	Recommendation Draft Number	Available Document / Status	Recommendation Title	Agenda Item	CPM Chapter
M.	[MS-MSS-1.6 GHz]	Preliminary draft new Rec. ITU-R M.[MS-MSS-1.6 GHz] (Doc. 8/165(Rev.1))	Sharing between the mobile service and the mobile-satellite service in the band 1 668.4-1 675 MHz	1.7	3
M.	[VHF-DATA]	Preliminary draft new Rec. ITU-R M.[VHF-DATA] (Doc. 8B/559 Annex 12)	Characteristics of VHF radio system and equipment for the exchange of data and electronic mail on maritime Appendix 18 channels	1.14	5
RS.	[10/36 GHz MITIGATE]	Draft new Rec. ITU-R RS.[10/36 GHz MITIGATE] (Doc. 7/67 as revised)	Technical and operational characteristics for passive sensors in the Earth exploration-satellite (passive) service to facilitate sharing of the 10.6-10.68 GHz and 36-37 GHz bands with the fixed and mobile services	1.2	2
SA.	[MET 18 GHz]	Draft new Rec. ITU-R SA.[MET 18 GHz] (Doc. 7/29)	System characteristics and sharing criteria for meteorological satellite systems operating around 18 GHz	1.2	2

4 List of existing ITU-R Reports

ITU-R Series	Report Number	Latest Publication	Report Title	Agenda Item	CPM Chapter
M.	2039	Rep. ITU-R M.2039	Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analyses	1.4	1
M.	2050	Rep. ITU-R M.2050	Test results illustrating the susceptibility of maritime radionavigation radars to emissions from digital communication and pulsed systems in the bands 2 900-3 100 and 9 200-9 500 MHz	1.3	1
F.	2060	Rep. ITU-R F.2060	Fixed service use in the IMT-2000 transport network	1.8	4
F.	2061	Rep. ITU-R F.2061	HF fixed radiocommunications systems	1.13	5
F.	2062	Rep. ITU-R F.2062	Enhanced high frequency digital radiocommunication systems capable of providing enhanced applications	1.13	5
BT.	2069	Rep. ITU-R BT.2069	Spectrum usage and operational characteristics of terrestrial electronic news gathering (ENG), television outside broadcast (TVOB) and electronic field production (EFP) systems	7.1 Issue B	7
BO.	2071	Rep. ITU-R BO.2071	System parameters of BSS between 17.3 GHz and 42.5 GHz and associated feeder links	1.21	2
BO.	2071	Rep. ITU-R BO.2071	System parameters of BSS between 17.3 GHz and 42.5 GHz and associated feeder links	7.1 Issue E	7
M.	2072	Rep. ITU-R M.2072	World mobile telecommunication market forecast	1.4	1

ITU-R Series	Report Number	Latest Publication	Report Title	Agenda Item	CPM Chapter
M.	2073	Rep. ITU-R M.2073	Feasibility and practicality of prioritization and real-time pre-emptive access between different networks of MSS in the bands 1 525-1 559 MHz and 1 626.5-1 660.5 MHz	1.6	1
M.	2074	Rep. ITU-R M.2074	Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000	1.4	1
BT.	2075	Rep. ITU-R BT.2075	Protection requirements for terrestrial television broadcasting services in the 620-790 MHz band against potential interference from GSO and non-GSO broadcasting-satellite systems and networks	1.11	3
M.	2076	Rep. ITU-R M.2076	Factors that mitigate interference from radiolocation and EESS/SRS (active) radars to maritime and aeronautical radionavigation radars in the 9.0-9.2 and 9.3-9.5 GHz bands and between EESS/SRS (active) radars and radiolocation radars in the 9.3-9.5 and 9.8-10.0 GHz bands	1.3	1
M.	2077	Rep. ITU-R M.2077 (Doc. 8/145(Rev.1))	Traffic forecasts and estimated spectrum requirements for the satellite component of IMT-2000 and systems beyond IMT-2000 for the period 2010 to 2020	1.4	1
M.	2078	Rep. ITU-R M.2078 (Doc. 8/148)	Estimated spectrum bandwidth requirements for the future development of IMT-2000 and IMT-Advanced	1.4	1
M.	2079	Rep. ITU-R M.2079	Technical and operational information for identifying spectrum for the terrestrial component of future development of IMT-2000 and IMT-Advanced	1.4	1

ITU-R Series	Report Number	Latest Publication	Report Title	Agenda Item	CPM Chapter
M.	2080	Rep. ITU-R M.2080 (Doc. 8/159)	Consideration of sharing conditions and usage in the 4-10 MHz band	1.13	5
M.	2081	Rep. ITU-R M.2081 (Doc. 8/160)	Test results illustrating compatibility between representative radionavigation systems and radiolocation and EESS systems in the band 8.5-10 GHz	1.3	1
M.	2082	Rep. ITU-R M.2082 (Doc. 8/162)	Proposed modifications of Appendix **17** (Frequencies and channelling arrangements in the high-frequency bands for the maritime mobile service) for a possible solution of agenda item 1.13 (Resolution **351**) during WRC-03	1.13	5
M.	2084	Rep. ITU-R M.2084 (Doc. 8/176)	Satellite detection of automatic identification system messages	1.14	5
M.	2085	Rep. ITU-R M.2085	Role of the amateur and amateur-satellite services in support of disaster mitigation and relief	1.13	5
F.	2087	Rep. ITU-R F.2087 (Doc 9/110)	Requirements For High Frequency (HF) Communications Systems	1.13	5
SM.	2091	Rep. ITU-R SM.2091 (Doc. 1/100 as revised)	Studies related to the impact of active space services allocated in adjacent or nearby bands on radio astronomy service	1.21	2
SM.	2092	Rep. ITU-R SM.2092 (Doc. 1/103 as revised)	Studies related to the impact of active services allocated in adjacent or nearby bands on EESS passive service	1.20	2

5 List of preliminary draft new or draft new ITU-R Reports, or list of working documents toward preliminary draft new ITU-R Reports

ITU-R Series	Report Draft Number	Available Document / Status	Report Title	Agenda Item	CPM Chapter
BS.	[Doc. 6E/357 ANNEX 6]	Preliminary draft new Rep. ITU-R BS.[Doc.] (Doc 6E/357 Annex 6)	Information Relating to the HF Broadcasting Service	1.13	5
F.	[10 GHz EESS-FS]	Working document towards preliminary draft new Rep. ITU-R F.[10 GHz EESS-FS] (Doc. 9D/219 Annex 9)	Sharing studies between fixed stations and passive sensors in the frequency band 10.6-10.68 GHz	1.2	2
F.	[36 GHz EESS-FS]	Working document towards preliminary draft new Rep. ITU-R F.[36 GHz EESS-FS] (Doc. 9D/219 Annex 8)	Sharing studies between fixed stations and passive sensors in the frequency band 36-37 GHz	1.2	2
M.	[AM(R)S 960-1164]	Working document towards preliminary draft new Rep. ITU-R M.[AM(R)S 960-1164] (Doc. 8B/559 Annex 10)	AM(R)S sharing feasibility in the 960-1 164 MHz band	1.6	1
M.	[AM(R)S Spectrum Requirements]	Working document towards preliminary draft new Rep. ITU-R M.[AM(R)S Spectrum Requirements] (Doc. 8B/559 Annex 9)	Initial estimate of new aviation AM(R)S spectrum requirements	1.6	1

ITU-R Series	Report Draft Number	Available Document / Status	Report Title	Agenda Item	CPM Chapter
M.	[AM(R)S-RNSS/RAS]	Working document towards preliminary draft new Rep. ITU-R M.[AM(R)S-RNSS/RAS] (Doc. 8B/559 Annex 8)	Compatibility between proposed new aeronautical mobile (R) service (AM(R)S) and both radionavigation satellite service (RNSS) in the 5 000-5 010 MHz and 5 010-5 030 MHz bands and radio astronomy in the 4 990-5 000 MHz band	1.6	1
M.	[AMS-FSS]	Preliminary draft new Rep. ITU-R M.[AMS-FSS] (Doc. 8B/559 Annex 6)	Compatibility between proposed systems in the aeronautical mobile service and the existing fixed-satellite service in the 5 091-5 150 MHz band	1.5	1
M.	[AMT 4/6 GHz]	Preliminary draft new Rep. ITU-R M.[AMT 4/6 GHz] (Doc. 8B/559 Annex 4)	Sharing between aeronautical mobile telemetry systems and systems of other co-primary services in the 4 400-4 940 and 5 925-6 700 MHz bands	1.5	1
M.	[Duty Cycle Tests]	Preliminary draft new Rep. ITU-R M.[Duty Cycle Tests] (Doc. 8B/559 Annex 11)	Test results illustrating the effective duty cycle of frequency modulated pulsed radiolocation and EESS waveforms in a marine radionavigation receiver	1.3	1
M.	[MSS-SRS-1.6 GHz]	Preliminary draft new Rep. ITU-R M.[MSS-SRS-1.6 GHz] (Annex to Doc. 8D/452)	Interference calculations to assess sharing between the GSO MSS and space research (passive) service in the band 1 668-1 668.4 MHz	1.7	3

ITU-R Series	Report Draft Number	Available Document / Status	Report Title	Agenda Item	CPM Chapter
SM.	2091	Rep. ITU-R SM.2091 (Doc. 1/100 as revised)	Studies related to the impact of active space services allocated in adjacent or nearby bands on radio astronomy service	1.21	2
SM.	2092	Rep. ITU-R SM.2092 (Doc. 1/103 as revised)	Studies related to the impact of active services allocated in adjacent or nearby bands on EESS passive service	1.20	2
RS.	2094	Rep. ITU-R RS.2094 (Doc. 7/69 as revised)	Studies related to the compatibility between EESS (active) and the radiodetermination service in the 9 300-9 500 MHz and 9 800-10 000 MHz bands and between EESS (active) and the fixed service in the 9 800-10 000 MHz band	1.3	1
RS.	2095	Rep. ITU-R RS.2095 (Doc. 7/65 as revised)	Sharing the 36-37 GHz band by the fixed and mobile services and the Earth exploration-satellite service (passive)	1.2	2
RS.	2096	Rep. ITU-R RS.2096 (Doc. 7/66 as revised)	Sharing the 10.6-10.68 GHz band by the fixed and mobile services and the Earth exploration-satellite service (passive)	1.2	2

6 List of ITU-R Questions

Question Number	Latest Publication	Title	Agenda Item	CPM Chapter
231/8	Question ITU-R 231/8	Operation of wideband aeronautical telemetry in bands above 3 GHz	1.5	1

7 Other ITU publications

Reference	Publication	Title	Agenda Item	CPM Chapter
Handbook	Handbook ITU-R Study Group 8	Migration to IMT-2000 Systems - Supplement 1 to the Handbook on Deployment of IMT-2000 Systems	1.4	1
ITU-D Question 18/2	ITU-D Question 18/2 Mid-Term Guidelines (MTG)	Strategy for migration of mobile networks to IMT-2000 and beyond Mid-Term Guidelines (MTG) on the smooth transition of existing mobile networks to IMT-2000 for developing countries	1.4	1