ITU Publications

International Telecommunication Union
Radiocommunication Sector

World Radiocommunication Conference 2023 (WRC-23)

Agenda and relevant resolutions

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www.itu.int/wrc-23

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Notes:

1. In the list below, 'AI' refers to 'WRC-23 agenda item', 'PAI' refers to 'WRC-27 preliminary agenda item' (see the results of the first session of the Conference Preparatory Meeting for WRC-23 (CPM23-1) in Administrative Circular CA/251).

2. For practical reasons, numbers '9.1-a)' to '9.1-d)' have been given to the topics identified under WRC-23 agenda item 9.1, including the fourth topic identified at CPM23-1 (see Administrative Circular CA/251).

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PREFACE

In accordance with Council Decision 623 (C21) and No. 42 of the Convention, the forthcoming World Radiocommunication Conference will take place in the United Arab Emirates (either in Abu Dhabi or Dubai), from 20 November to 15 December 2023, preceded by the 2023 Radiocommunication Assembly (RA-23) from 13-17 November 2023. The Agenda of WRC-23 is in accordance with Council Resolution 1399 (C20) and No. 118 of the Convention. This conference will be crucial in continuing global progress in the enhancement of radiocommunication services and the use of the radio-frequency spectrum and satellite orbits.

This booklet provides an easy access to the WRC-23 agenda as well as to the pertinent resolutions referenced therein. It has been prepared following the past initiatives of the International Amateur Radio Union (www.iaru.org) and in order to maintain this good tradition to better assist the ITU membership in the preparations for the conference.

In addition, ITU-R preparatory studies and activities for WRC-23 can be found at www.itu.int/go/rcpm-wrc-23-studies.

I wish all of the participants to this extraordinary event enlightening discussions based on a spirit of deep cooperation that will definitely lead, as for past events, to a most successful outcome.

Mario Maniewicz
Director, Radiocommunication Bureau

COUNCIL DECISION 623

(adopted by correspondence)

Place and dates of the World Radiocommunication Conference (WRC-23) and Radiocommunication Assembly (RA-23)

(see document C21/96)

The ITU Council,

noting

that Resolution 811 of the World Radiocommunication Conference (Sharm el Sheikh, 2019):

a) resolved to recommend to the Council that a world radiocommunication conference be held in 2023 for a maximum period of four weeks;

b) recommended its agenda, and invited the Council to finalize the agenda and arrange for the convening of the 2023 World Radiocommunication Conference (WRC-23) and to initiate as soon as possible the necessary consultation with the Member States,

noting further

Council Resolution 1399, which received the agreement of the required majority of the Member States of ITU, established the agenda of the WRC-23,

decides

that, subject to the concurrence of the majority of the Member States of the Union, the next World Radiocommunication Conference will take place either in Abu Dhabi or Dubai, UAE from 20 November to 15 December 2023, preceded by the 2023 Radiocommunication Assembly (RA-23) from 13-17 November 2023,

instructs the Secretary-General

1 to carry out a consultation with all Member States on the exact dates and place of RA-23 and WRC-23;

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

COUNCIL RESOLUTION 1399

(adopted by correspondence)

Agenda of the World Radiocommunication Conference (WRC-23)

(see document C20/69)

The ITU Council,

noting

that Resolution 811 of the World Radiocommunication Conference (Sharm el Sheikh, 2019):

a) resolved to recommend to the Council that a world radiocommunication conference be held in 2023 for a maximum period of four weeks;

b) recommended its agenda, and invited the Council to finalize the agenda and arrange for the convening of WRC-23 and to initiate as soon as possible the necessary consultation with Member States,

resolves

to convene a World Radiocommunication Conference (WRC-23) in 2023, preceded by the Radiocommunication Assembly, with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC-19 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the frequency bands under consideration, to consider and take appropriate action in respect of the following items:

1.1 to consider, based on the results of the ITU-R studies, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the aeronautical and maritime mobile services located in international airspace and waters from other stations located within national territories, and to review the pfd criteria in No. **5.441B** in accordance with Resolution **223 (Rev.WRC-19)**;

1.2 to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **245 (WRC-19)**;

1.3 to consider primary allocation of the band 3 600-3 800 MHz to mobile service within Region 1 and take appropriate regulatory actions, in accordance with Resolution **246 (WRC-19)**;

1.4 to consider, in accordance with Resolution **247 (WRC-19)**, the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level;

1.5 to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review in accordance with Resolution **235** **(WRC-15)**;

1.6 to consider, in accordance with Resolution **772** **(WRC-19)**, regulatory provisions to facilitate radiocommunications for sub-orbital vehicles;

1.7 to consider a new aeronautical mobile-satellite (R) service (AMS(R)S) allocation in accordance with Resolution **428** **(WRC-19)** for both the Earth-to-space and space-to-Earth directions of aeronautical VHF communications in all or part of the frequency band 117.975-137 MHz, while preventing any undue constraints on existing VHF systems operating in the AM(R)S, the ARNS, and in adjacent frequency bands;

1.8 to consider, on the basis of ITU-R studies in accordance with Resolution **171** **(WRC-19)**, appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution **155** **(Rev.WRC-19)** and No. **5.484B** to accommodate the use of fixed-satellite service (FSS) networks by control and non-payload communications of unmanned aircraft systems;

1.9 to review Appendix **27** of the Radio Regulations and consider appropriate regulatory actions and updates based on ITU-R studies, in order to accommodate digital technologies for commercial aviation safety-of-life applications in existing HF bands allocated to the aeronautical mobile (route) service and ensure coexistence of current HF systems alongside modernized HF systems, in accordance with Resolution **429** **(WRC-19)**;

1.10 to conduct studies on spectrum needs, coexistence with radiocommunication services and regulatory measures for possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications, in accordance with Resolution **430** **(WRC-19)**;

1.11 to consider possible regulatory actions to support the modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation, in accordance with Resolution **361** **(Rev.WRC-19)**;

1.12 to conduct, and complete in time for WRC-23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with Resolution **656** **(Rev.WRC-19)**;

1.13 to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with Resolution **661** **(WRC-19)**;

1.14 to review and consider possible adjustments of the existing or possible new primary frequency allocations to EESS (passive) in the frequency range 231.5-252 GHz, to ensure alignment with more up-to-date remote-sensing observation requirements, in accordance with Resolution **662** **(WRC-19)**;

1.15 to harmonize the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service globally, in accordance with Resolution **172** **(WRC-19)**;

1.16 to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by non-GSO FSS earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution **173** **(WRC-19)**;

1.17 to determine and carry out, on the basis of the ITU-R studies in accordance with Resolution **773** **(WRC-19)**, the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate;

1.18 to consider studies relating to spectrum needs and potential new allocations to the mobile-satellite service for future development of narrowband mobile-satellite systems, in accordance with Resolution **248** **(WRC-19)**;

1.19 to consider a new primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2, while protecting existing primary services in the band, in accordance with Resolution **174** **(WRC-19)**;

2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with *further resolves* of Resolution **27** **(Rev.WRC-19)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in *resolves* of that Resolution;

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-19)**, 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 to consider possible changes, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86** **(Rev.WRC-07)**, in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

8 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26** **(Rev.WRC-19)**;

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

9.1 on the activities of the Radiocommunication Sector since WRC-19;

– In accordance with Resolution **657** **(Rev.WRC-19)**, review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;

– Review of the amateur service and the amateur-satellite service allocations in the frequency band 1 240-1 300 MHz to determine if additional measures are required to ensure protection of the radionavigation-satellite (space-to-Earth) service operating in the same band in accordance with Resolution **774** **(WRC-19)**;

– Study the use of International Mobile Telecommunication system for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution **175** **(WRC-19)**;

9.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and[1]

9.3 on action in response to Resolution **80** **(Rev.WRC-07)**;

10 to recommend to the Council items for inclusion in the agenda for the next WRC, and items for the preliminary agenda of future conferences, in accordance with Article 7 of the Convention and Resolution **804** **(Rev.WRC-19)**.

[1] This agenda sub-item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations. Administrations are invited to inform the Director of the Radiocommunication Bureau of any difficulties or inconsistencies encountered in the Radio Regulations.

Note by the Secretariat: A fourth topic has been identified at CPM23-1 under WRC-23 agenda item 9.1 (see Administrative Circular CA/251), and the four topics under this agenda item are numbered as follows:

(9.1-a) In accordance with Resolution **657** **(Rev.WRC-19)**, review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services

(9.1-b) Review of the amateur service and the amateur-satellite service allocations in the frequency band 1 240-1 300 MHz to determine if additional measures are required to ensure protection of the radionavigation-satellite (space-to-Earth) service operating in the same band in accordance with Resolution **774** **(WRC-19)**

(9.1-c) Study the use of International Mobile Telecommunication systems for fixed wireless broadband in the frequency bands allocated to the fixed services on primary basis, in accordance with Resolution **175** **(WRC-19)**

(9.1-d) Protection of EESS (passive) in the frequency band 36-37 GHz from non-GSO FSS space stations

RESOLUTION 811 (WRC-19)

Agenda for the 2023 world radiocommunication conference

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for a world radiocommunication conference (WRC) should be established four to six years in advance and that a final agenda shall be established by the ITU Council two years before the conference;

b) Article 13 of the ITU Constitution relating to the competence and scheduling of WRCs and Article 7 of the Convention relating to their agendas;

c) the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and WRCs,

recognizing

a) that this conference has identified a number of urgent issues requiring further examination by WRC-23;

b) that, in preparing this agenda, some items proposed by administrations could not be included and have had to be deferred to future conference agendas,

resolves

to recommend to the Council that a WRC be held in 2023 for a maximum period of four weeks, with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC-19 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the frequency bands under consideration, to consider and take appropriate action in respect of the following items:

1.1 to consider, based on the results of ITU-R studies, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the aeronautical and maritime mobile services located in international airspace and waters from other stations located within national territories, and to review the power flux-density criteria in No. **5.441B** in accordance with Resolution **223** **(Rev.WRC-19)**;

1.2 to consider identification of the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **245** **(WRC-19)**;

1.3 to consider primary allocation of the frequency band 3 600-3 800 MHz to the mobile service in Region 1 and take appropriate regulatory actions, in accordance with Resolution **246** **(WRC-19)**;

1.4 to consider, in accordance with Resolution **247** **(WRC-19)**, the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level;

1.5 to review the spectrum use and spectrum needs of existing services in the frequency band 470-960 MHz in Region 1 and consider possible regulatory actions in the frequency band 470-694 MHz in Region 1 on the basis of the review, in accordance with Resolution **235** **(WRC-15)**;

1.6 to consider, in accordance with Resolution **772** **(WRC-19)**, regulatory provisions to facilitate radiocommunications for sub-orbital vehicles;

1.7 to consider a new aeronautical mobile-satellite (R) service allocation in accordance with Resolution **428** **(WRC-19)** for both the Earth-to-space and space-to-Earth directions of aeronautical VHF communications in all or part of the frequency band 117.975-137 MHz, while preventing any undue constraints on existing VHF systems operating in the aeronautical mobile (R) service, in the aeronautical radionavigation service, and in adjacent frequency bands;

1.8 to consider, on the basis of ITU-R studies in accordance with Resolution **171** **(WRC-19)**, appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution **155** **(Rev.WRC-19)** and No. **5.484B** to accommodate the use of fixed-satellite service networks by control and non-payload communications of unmanned aircraft systems;

1.9 to review Appendix **27** of the Radio Regulations and consider appropriate regulatory actions and updates based on ITU-R studies, in order to accommodate digital technologies for commercial aviation safety-of-life applications in existing HF bands allocated to the aeronautical mobile (R) service and ensure coexistence of current HF systems alongside modernized HF systems, in accordance with Resolution **429** **(WRC-19)**;

1.10 to conduct studies on spectrum needs, coexistence with radiocommunication services and regulatory measures for possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications, in accordance with Resolution **430** **(WRC-19)**;

1.11 to consider possible regulatory actions to support the modernization of the Global Maritime Distress and Safety System (GMDSS) and the implementation of e-navigation, in accordance with Resolution **361** **(Rev.WRC-19)**;

1.12 to conduct, and complete in time for WRC-23, studies for a possible new secondary allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with Resolution **656** **(Rev.WRC-19)**;

1.13 to consider a possible upgrade of the allocation of the frequency band 14.8-15.35 GHz to the space research service, in accordance with Resolution **661** **(WRC-19)**;

1.14 to review and consider possible adjustments of the existing frequency allocations or possible new primary frequency allocations to the Earth exploration-satellite service (passive) in the frequency range 231.5-252 GHz, to ensure alignment with more up-to-date remote-sensing observation requirements, in accordance with Resolution **662** **(WRC-19)**;

1.15 to harmonize the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service globally, in accordance with Resolution **172** **(WRC-19)**;

1.16 to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by non-geostationary fixed-satellite service earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution **173** **(WRC-19)**;

1.17 to determine and carry out, on the basis of ITU-R studies in accordance with Resolution **773** **(WRC-19)**, the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate;

1.18 to consider studies relating to spectrum needs and potential new allocations to the mobile-satellite service for future development of narrowband mobile-satellite systems, in accordance with Resolution **248** **(WRC-19)**;

1.19 to consider a new primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2, while protecting existing primary services in the band, in accordance with Resolution **174** **(WRC-19)**;

2 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with *further resolves* of Resolution **27** **(Rev.WRC-19)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in *resolves* of that Resolution;

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-19)**, 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 ITU Convention;

6 to identify those items requiring urgent action by the radiocommunication study groups in preparation for the next world radiocommunication conference;

7 to consider possible changes, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86** **(Rev.WRC-07)**, in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

8 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26** **(Rev.WRC-19)**;

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the ITU Convention;

9.1 on the activities of the ITU Radiocommunication Sector since WRC-19:

– In accordance with Resolution **657** **(Rev.WRC-19)**, review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services;

– Review the amateur service and the amateur-satellite service allocations in the frequency band 1 240-1 300 MHz to determine if additional measures are required to ensure protection of the radionavigation-satellite service (space-to-Earth) operating in the same band in accordance with Resolution **774** **(WRC-19)**;

– Study the use of International Mobile Telecommunication systems for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis, in accordance with Resolution **175** **(WRC-19)**;

9.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations;[1] and

9.3 on action in response to Resolution **80** **(Rev.WRC-07)**;

10 to recommend to the ITU Council items for inclusion in the agenda for the next world radiocommunication conference, and items for the preliminary agenda of future conferences, in accordance with Article 7 of the ITU Convention and Resolution **804** **(Rev.WRC-19)**,

invites the ITU Council

to finalize the agenda and arrange for the convening of WRC-23, and to initiate as soon as possible the necessary consultations with Member States,

instructs the Director of the Radiocommunication Bureau

1 to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting (CPM) and to prepare a report to WRC-23;

2 to submit a draft report on any difficulties or inconsistencies encountered in the application of the Radio Regulations referred in agenda item 9.2 to the second session of the CPM and to submit the final report at least five months before the next WRC,

instructs the Secretary-General

to communicate this Resolution to international and regional organizations concerned.

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[1] This agenda sub-item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations. Administrations are invited to inform the Director of the Radiocommunication Bureau of any difficulties or inconsistencies encountered in the Radio Regulations.

RESOLUTION 812 (WRC-19)

Preliminary agenda for the 2027 World Radiocommunication Conference*

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for WRC-27 should be established four to six years in advance;

b) Article 13 of the ITU Constitution relating to the competence and scheduling of world radiocommunication conferences (WRCs) and Article 7 of the Convention relating to their agendas;

c) the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and WRCs,

resolves to give the view

that the following items should be included in the preliminary agenda for WRC-27:

1 to take appropriate action in respect of those urgent issues that were specifically requested by WRC-23;

2 on the basis of proposals from administrations and the Report of the Conference Preparatory Meeting, and taking account of the results of WRC-23, to consider and take appropriate action in respect of the following items:

2.1 to consider, in accordance with Resolution **663 (WRC-19)**, additional spectrum allocations to the radiolocation service on a co-primary basis in the frequency band 231.5-275 GHz and an identification for radiolocation applications in frequency bands in the frequency range 275-700 GHz for millimetre and sub-millimetre wave imaging systems;

2.2 to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 37.5-39.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by aeronautical and maritime earth stations in motion communicating with geostationary space stations in the fixed-satellite service, in accordance with Resolution **176 (WRC-19)**;

2.3 to consider the allocation of all or part of the frequency band [43.5-45.5 GHz] to the fixed-satellite service, in accordance with Resolution **177 (WRC-19)**;

2.4 the introduction of power flux-density (pfd) and equivalent isotropically radiated power (e.i.r.p.) limits in Article **21** for the frequency bands 71-76 GHz and 81-86 GHz in accordance with Resolution **775 (WRC-19)**;

2.5 the conditions for the use of the frequency bands 71-76 GHz and 81-86 GHz by stations in the satellite services to ensure compatibility with passive services in accordance with Resolution **776 (WRC-19)**;

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* The appearance of square brackets around certain frequency bands in this Resolution is understood to mean that WRC-23 will consider and review the inclusion of these frequency bands with square brackets and decide, as appropriate.

2.6 to consider regulatory provisions for appropriate recognition of space weather sensors and their protection in the Radio Regulations, taking into account the results of ITU Radiocommunication Sector studies reported to WRC-23 under agenda item 9.1 and its corresponding Resolution **657** **(Rev.WRC-19)**;

2.7 to consider the development of regulatory provisions for non-geostationary fixed-satellite system feeder links in the frequency bands 71-76 GHz (space-to-Earth and proposed new Earth-to-space) and 81-86 GHz (Earth-to-space), in accordance with Resolution **178** **(WRC-19)**;

2.8 to study the technical and operational matters, and regulatory provisions, for space-to-space links in the frequency bands [1 525-1 544 MHz], [1 545-1 559 MHz], [1 610-1 645.5 MHz], [1 646.5-1 660.5 MHz] and [2 483.5-2 500 MHz] among non-geostationary and geostationary satellites operating in the mobile-satellite service, in accordance with Resolution **249** **(WRC-19)**;

2.9 to consider possible additional spectrum allocations to the mobile service in the frequency band 1 300-1 350 MHz to facilitate the future development of mobile-service applications, in accordance with Resolution **250** **(WRC-19)**;

2.10 to consider improving the utilization of the VHF maritime frequencies in Appendix **18**, in accordance with Resolution **363** **(WRC-19)**;

2.11 to consider a new Earth exploration-satellite service (Earth-to-space) allocation in the frequency band 22.55-23.15 GHz, in accordance with Resolution **664** **(WRC-19)**;

2.12 to consider the use of existing International Mobile Telecommunications (IMT) identifications in the frequency range 694-960 MHz, by consideration of the possible removal of the limitation regarding aeronautical mobile in IMT for the use of IMT user equipment by non-safety applications, where appropriate, in accordance with Resolution **251** **(WRC-19)**;

2.13 to consider a possible worldwide allocation to the mobile-satellite service for the future development of narrowband mobile-satellite systems in frequency bands within the frequency range [1.5-5 GHz], in accordance with Resolution **248** **(WRC-19)**;

3 to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with *further resolves* of Resolution **27** **(Rev.WRC-19)**, and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in *resolves* of that Resolution;

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

5 in accordance with Resolution **95** **(Rev.WRC-19)**, to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation;

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

7 to identify those items requiring urgent action by the radiocommunication study groups;

8 to consider possible changes, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86** **(Rev.WRC-07)**, in order to facilitate the rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

9 to consider and take appropriate action on requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required, taking into account Resolution **26** **(Rev.WRC-19)**;

10 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the ITU Convention;

10.1 on the activities of the Radiocommunication Sector since WRC-23;

10.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations[1]; and

10.3 on action in response to Resolution **80** **(Rev.WRC-07)**;

11 to recommend to the ITU Council items for inclusion in the agenda for the next world radiocommunication conference, and items for the preliminary agenda of future conferences, in accordance with Article 7 of the ITU Convention and Resolution **804** **(Rev.WRC-19)**,

invites the ITU Council

to finalize the agenda and arrange for the convening of WRC-27, and to initiate as soon as possible the necessary consultations with Member States,

instructs the Director of the Radiocommunication Bureau

1 to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting (CPM) and to prepare a report to WRC-27;

2 to submit a draft Report on any difficulties or inconsistencies encountered in the application of the Radio Regulations as referred in agenda item 10.2 to the second session of CPM and to submit the final Report at least five months before the next WRC,

instructs the Secretary-General

to communicate this Resolution to international and regional organizations concerned.

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[1] This agenda sub-item is strictly limited to the Report of the Director on any difficulties or inconsistencies encountered in the application of the Radio Regulations and the comments from administrations. Administrations are invited to inform the Director of the Radiocommunication Bureau of any difficulties or inconsistencies encountered in the Radio Regulations.

RESOLUTION 26 (REV.WRC-19)

Footnotes to the Table of Frequency Allocations in Article 5 of the Radio Regulations

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that footnotes are an integral part of the Table of Frequency Allocations in the Radio Regulations and, as such, form part of an international treaty text;

b) that footnotes to the Table of Frequency Allocations should be clear, concise and easy to understand;

c) that footnotes should relate directly to matters of frequency allocation;

d) that, in order to ensure that footnotes allow modification of the Table of Frequency Allocations without introducing unnecessary complications, principles relating to the use of footnotes are needed;

e) that, currently, footnotes are adopted by competent world radiocommunication conferences (WRCs) and any addition, modification or deletion of a footnote is considered and adopted by the competent conference;

f) that some problems concerning country footnotes may be resolved through the application of a special agreement envisaged by Article **6**;

g) that, in certain cases, administrations are confronted with major difficulties due to inconsistencies or omissions in footnotes;

h) that, in order to keep the footnotes to the Table of Frequency Allocations up to date, there should be clear and effective guidelines for additions, modifications and deletions of footnotes,

noting

a) that some footnotes have been developed and revised under relevant agenda items of WRCs, while footnotes which are not related to those agenda items were considered by previous WRCs, as described in Annex 1 to this Resolution, under the standing agenda item referred to in *further resolves* 2;

b) that, under certain circumstances and on a purely exceptional basis, previous WRCs considered proposals for the addition of country names to existing footnotes which were not related to the case mentioned in *further resolves* 1;

c) that previous conferences also received proposals for the addition of new country footnotes not related to any agenda items, and that these proposals were not accepted;

d) that administrations need sufficient time to examine the potential consequences of changes to footnotes to the Table of Frequency Allocations;

e) the importance of coordination between countries before a WRC to agree on changes related to country footnotes,

resolves

1 that, wherever possible, footnotes to the Table of Frequency Allocations should be confined to altering, limiting or otherwise changing the relevant allocations rather than dealing with the operation of stations, assignment of frequencies or other matters;

2 that the Table of Frequency Allocations should include only those footnotes which have international implications for the use of the radio-frequency spectrum;

3 that new footnotes to the Table of Frequency Allocations should only be adopted in order to:

a) achieve flexibility in the Table of Frequency Allocations;

b) protect the relevant allocations in the body of the Table and in other footnotes in accordance with Section II of Article **5**;

c) introduce either transitional or permanent restrictions on a new service to achieve compatibility; or

d) meet the specific requirements of a country or area when it is impracticable to satisfy such needs otherwise within the Table of Frequency Allocations;

4 that footnotes serving a common purpose should be in a common format, and, where possible, be grouped into a single footnote with appropriate references to the relevant frequency bands,

further resolves

1 that any addition of a new footnote or modification of an existing footnote should be considered by a WRC only when:

a) the agenda of that WRC explicitly includes the frequency band to which the proposed additional or modified footnote relates; or

b) the frequency bands to which the desired additions or modifications of the footnote belong are considered during WRC and WRC decides to make a change in those frequency bands; or

c) the addition or modification of footnotes is specifically included in the agenda of WRC as a result of the consideration of proposals submitted by one or more interested administration(s);

2 that recommended agendas for future WRCs should include a standing agenda item which would allow for the consideration of proposals by administrations for deletion of country footnotes, or country names in footnotes, if no longer required;

3 that in cases not covered by *further resolves* 1 and 2, proposals for new footnotes or modification of existing footnotes could exceptionally be considered by a WRC if they concern corrections of obvious omissions, inconsistencies, ambiguities or editorial errors and have been submitted to ITU as stipulated in No. 40 of the General Rules of conferences, assemblies and meetings of the Union,

urges administrations

1 to review footnotes periodically and to propose the deletion of their country footnotes or of their country names from footnotes, as appropriate;

2 to take account of *further resolves* above in making proposals to WRCs in relation to footnotes or country names in footnotes.

ANNEX 1 TO RESOLUTION 26 (REV.WRC-19)

Previous WRCs have recognized that the scope of the standing agenda item is only related to requests from administrations to delete their country footnotes or to have their country name deleted from footnotes, if no longer required. However, previous WRCs have also received proposals on the addition of country names to existing footnotes and on the addition of new country footnotes.

It is recognized that it is not the intention of WRCs to encourage the addition of country names to existing footnotes.

Taking into account the decisions of WRC-12, WRC-15 and WRC-19 on the same subject, it is suggested that future WRCs may apply a similar approach to previous WRCs.

Future WRCs may consider the following guidance derived from the above-mentioned decisions.

A) The work of WRC on proposals submitted under the standing agenda item described in *further resolves* 2 of this Resolution may be based on the following:

i) Under certain circumstances, on a purely exceptional basis and if justified, proposals for the addition of country names to existing footnotes may be considered by WRCs, but their acceptance is subject to the express condition that there are no objections from affected countries.

ii) Should a WRC decide to accept submissions of additional proposals for the addition of country names to existing footnotes based on the proposals received, it may establish a deadline for such further contributions to WRC.

iii) A deadline may also be established for proposals on the deletion of country names, if appropriate, taking into account that administrations require sufficient time to analyse the proposals.

iv) Proposals for the addition of new country footnotes which are not related to agenda items of a WRC or cases described in *further resolves* 1 of this Resolution should not be considered.

B) The proposals on additions of country names to existing footnotes or new country footnotes in the cases addressed by *further resolves* 1 of this Resolution are to be treated in the committees responsible under the relevant agenda items, as appropriate.

Administrations are invited to submit their proposals under relevant agenda items.

Proposals for additions which do not fall within the categories referred to in *further resolves* 1 of this Resolution may be considered by the WRC committee responsible for proposals submitted under the standing agenda item described in *further resolves* 2 of this Resolution and are subject to the principles mentioned in A) above.

RESOLUTION 27 (REV.WRC-19)

Use of incorporation by reference in the Radio Regulations

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the Voluntary Group of Experts (VGE) on simplification of the Radio Regulations proposed the transfer of certain texts of the Radio Regulations to other documents, especially to the ITU Radiocommunication Sector (ITU-R) Recommendations, using the incorporation by reference procedure;

b) that the principles of incorporation by reference were adopted by WRC-95 and revised by subsequent conferences;

c) that, in some cases, there are provisions in the Radio Regulations containing references which fail to distinguish adequately whether the status of the referenced text is mandatory or non-mandatory;

d) that all texts of ITU-R Recommendations incorporated by reference are published in a volume of the Radio Regulations;

e) that, taking into account the rapid evolution of technology, ITU-R may revise the ITU-R Recommendations containing text incorporated by reference at short intervals;

f) that, following revision of an ITU-R Recommendation containing text incorporated by reference, the reference in the Radio Regulations shall continue to apply to the earlier version until such time as a competent world radiocommunication conference (WRC) agrees to incorporate the new version;

g) that it would be desirable that texts incorporated by reference reflect the most recent technical developments,

noting

a) that references to Resolutions or Recommendations of a WRC require no special procedures, and are acceptable for consideration, since such texts will have been agreed by a WRC;

b) that administrations need sufficient time to examine the potential consequences of changes to ITU-R Recommendations containing text incorporated by reference and would therefore benefit greatly from being advised, as early as possible, of which ITU-R Recommendations have been revised and approved during the elapsed study period or at the Radiocommunication Assembly (RA) preceding WRC,

resolves

1 that, for the purposes of the Radio Regulations, the term “incorporation by reference” shall only apply to those references intended to be mandatory;

2 that the text incorporated by reference shall have the same treaty status as the Radio Regulations themselves;

3 that the reference shall be explicit, specifying the specific part of the text (if appropriate) and the version or issue number;

4 that, where a mandatory reference to an ITU-R Recommendation, or parts thereof, is included in the *resolves* of a WRC Resolution, which is itself cited in a provision or footnote of the Radio Regulations using mandatory language (i.e. "shall"), the ITU-R Recommendation or parts thereof shall also be considered as incorporated by reference;

5 that 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;

6 that, when considering the introduction of new cases of incorporation by reference, such incorporation shall be kept to a minimum and made by applying the following criteria:

6.1 only texts which are relevant to a specific WRC agenda item may be considered;

6.2 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;

6.3 the guidance contained in Annex 1 to this Resolution shall be applied in order to ensure that the correct method of reference for the intended purpose is employed;

7 that the text to be incorporated by reference shall be submitted for adoption by a competent WRC and the procedure described in Annex 2 to this Resolution shall be applied for approving the incorporation by reference of ITU-R Recommendations or parts thereof;

8 that existing references to ITU-R Recommendations shall be reviewed to clarify whether the reference is mandatory or non-mandatory in accordance with Annex 1 to this Resolution;

9 that ITU-R Recommendations, or parts thereof, incorporated by reference at the conclusion of each WRC, and a cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating such ITU-R Recommendations by reference, shall be collated and published in a volume of the Radio Regulations (see Annex 2 to this Resolution);

10 that 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 the *further resolves* part of this Resolution,

further resolves

1 that each RA shall communicate to the next WRC a list of the ITU-R Recommendations containing text incorporated by reference in the Radio Regulations which have been revised and approved during the elapsed study period;

2 that, on this basis, WRC is invited to examine those revised ITU-R Recommendations, and decide whether or not to update the corresponding references in the Radio Regulations;

3 that, if WRC decides not to update the corresponding references, the currently referenced version shall be maintained in the Radio Regulations;

4 to invite future WRCs to include a standing agenda item on examination of the revised ITU-R Recommendations in accordance with *further resolves* 1 and 2 of this Resolution,

instructs the Director of the Radiocommunication Bureau

1 to bring this Resolution to the attention of RA and the radiocommunication study groups;

2 to identify the provisions and footnotes of the Radio Regulations containing references to ITU-R Recommendations and make suggestions on any further action to the second session of the Conference Preparatory Meeting (CPM) for its consideration and inclusion in the CPM Report;

3 to identify the provisions and footnotes of the Radio Regulations containing references to WRC Resolutions that contain references to ITU-R Recommendations, and make suggestions on any further action to the second session of CPM for its consideration and inclusion in the CPM Report;

4 to provide the second session of CPM with a list, for inclusion in the CPM Report, of those ITU-R Recommendations containing texts incorporated by reference that have been revised or approved since the previous WRC, or that may be revised in time for the next WRC,

invites administrations

1 to submit proposals to future conferences, taking into account the CPM Report, in order to clarify the status of references, where ambiguities remain regarding the mandatory or non-mandatory status of the references in question, with a view to amending those references:

i) that appear to be of a mandatory nature, identifying such references as being incorporated by reference by using clear linking language in accordance with Annex 1 to this Resolution;

ii) that are of a non-mandatory character, so as to refer to “the most recent version” of the Recommendations;

2 to participate actively in the work of the radiocommunication study groups and the RA on revision of those Recommendations to which mandatory references are made in the Radio Regulations;

3 to examine any indicated revisions of ITU-R Recommendations containing text incorporated by reference and to prepare proposals on possible updating of relevant references in the Radio Regulations.

ANNEX 1 TO RESOLUTION 27 (REV.WRC-19)

Application of incorporation by reference

When introducing new cases of incorporation by reference in the provisions of the Radio Regulations or reviewing existing cases of incorporation by reference, administrations and ITU-R should address the following factors in order to ensure that the correct method of reference is employed for the intended purpose, according to whether each reference is mandatory (i.e. incorporated by reference) or non-mandatory:

Mandatory references

1 Mandatory references shall use clear linking language, i.e. “shall”.

2 Mandatory references shall be explicitly and specifically identified, e.g. ”Recommendation ITU-R M.541-8”.

3 If the intended reference material is, as a whole, unsuitable as treaty-status text, the reference shall be limited to just those portions of the material in question which are of a suitable nature, e.g. ”Annex A to Recommendation ITU-R Z.123-4”.

Non-mandatory references

4 Non-mandatory references or ambiguous references that are determined to be of a non-mandatory character (i.e. not incorporated by reference) shall use appropriate language, such as “should” or “may”. This appropriate language may refer to “the most recent version” of a Recommendation. Any appropriate language may be changed at any future WRC.

ANNEX 2 TO RESOLUTION 27 (REV.WRC-19)

Procedures applicable by WRC for approving the incorporation by reference of ITU-R Recommendations or parts thereof

During the course of each WRC, a list of the ITU-R Recommendations incorporated by reference, and a cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating such ITU-R Recommendations by reference, shall be developed and maintained by the committees. These lists shall be published as a conference document in line with developments during the conference.

Following the end of each WRC, the Radiocommunication Bureau and the General Secretariat will update the volume of the Radio Regulations which serves as the repository of ITU-R Recommendations incorporated by reference in line with developments at the conference as recorded in the above-mentioned document.

RESOLUTION 80 (REV.WRC-07)

Due diligence in applying the principles embodied in the Constitution

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that Articles 12 and 44 of the Constitution lay down the basic principles for the use of the radio-frequency spectrum and the geostationary-satellite and other satellite orbits;

b) that those principles have been included in the Radio Regulations;

c) that Article I of the Agreement between the United Nations and the International Telecommunication Union provides that "the United Nations recognizes the International Telecommunication Union (hereinafter called "the Union") as the specialized agency responsible for taking such action as may be appropriate under its basic instrument for the accomplishment of the purposes set forth therein";

d) that, in accordance with Nos. **11.30**, **11.31** and **11.31.2**, notices shall be examined with respect to the provisions of the Radio Regulations, including the provision relating to the basic principles, appropriate rules of procedure being developed for the purpose;

e) that WRC-97 instructed the Radio Regulations Board (RRB) to develop, within the framework of Nos. **11.30**, **11.31** and **11.31.2**, rules of procedure to be followed in order to be in compliance with the principles in No. **0.3** of the Preamble to the Radio Regulations;

f) that the Board, in accordance with Resolution **80 (WRC-97)**, submitted a report to WRC-2000 suggesting possible solutions and stating that, after examining the Radio Regulations, it had concluded that there are no provisions currently in the Radio Regulations that link the formal notification or coordination procedures with the principles stated in No. **0.3** of the Preamble to the Radio Regulations;

g) that the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space of the United Nations General Assembly has drawn up recommendations in this respect,

noting

a) that, in accordance with the provisions of No. 127 of the Convention, the Conference may give instructions to the Sectors of the Union;

b) that, according to No. 160C of the Convention, the Radiocommunication Advisory Group (RAG) shall review any matter as directed by a conference;

c) the RRB report to WRC-2000 (see Annex 1);

d) the RRB report to WRC-03 (see Annex 2);

e) that some of the issues identified in the report referred to in *noting c)* have been resolved before WRC-07,

resolves

1 to instruct the Radiocommunication Sector, in accordance with No. 1 of Article 12 of the Constitution, to carry out studies on procedures for measurement and analysis of the application of the basic principles contained in Article 44 of the Constitution;

2 to instruct the RRB to consider and review possible draft recommendations and draft provisions linking the formal notification, coordination and registration procedures with the principles contained in Article 44 of the Constitution and No. 0.3 of the Preamble to the Radio Regulations, and to report to each future World Radiocommunication Conference with regard to this Resolution;

3 to instruct the Director of the Radiocommunication Bureau to submit to each future World Radiocommunication Conference a detailed progress report on the action taken on this Resolution,

invites

1 the other organs of the Radiocommunication Sector, in particular the RAG, to make relevant contributions to the Director of the Radiocommunication Bureau for inclusion in his report to each future World Radiocommunication Conference;

2 administrations to contribute to the studies referred to in *resolves* 1 and to the work of the RRB as detailed in *resolves* 2.

ANNEX 1 TO RESOLUTION 80 (REV.WRC-07)

RRB Report to WRC-2000

In the RRB Report to WRC-2000[1], several members of the Board noted some difficulties likely to be experienced by administrations, particularly administrations of developing countries, as follows:

– the "first-come first-served" concept restricts and sometimes prevents access to and use of certain frequency bands and orbit positions;

– a relative disadvantage for developing countries in coordination negotiations due to various reasons such as a lack of resources and expertise;

– perceived differences in consistency of application of the Radio Regulations;

– the submitting of "paper" satellites that restricts access options;

– the growing use of the bands of the Plans of Appendices **30** and **30A** by regional, multichannel systems, which may modify the main purpose of these Plans to provide equitable access to all countries;

[1] This Report can be found in Document 29 to WRC-2000.

– the considerable processing delays in the Radiocommunication Bureau are due to the very complex procedures required and the large number of filings submitted; these delays contribute to a coordination backlog of 18 months which could extend to three years and creates uncertain regulatory situations, additional delay in the coordination process that cannot be overcome by administrations, and the possible loss of the assignment because the allotted time is exceeded;

– satellite systems may already be in orbit before completion of coordination;

– statutory time-frames, such as those in No. **11.48**, may often be insufficient for developing countries to be able to complete the regulatory requirements as well as the design, construction and launch of satellite systems;

– no provisions for international monitoring to confirm the bringing into use of satellite networks (assignments and orbits).

ANNEX 2 TO RESOLUTION 80 (REV.WRC-07)

RRB Report to WRC-03

In the RRB Report to WRC-03[2], concepts to satisfy *resolves* 2 of Resolution **80 (WRC-2000)** were provided, as follows:

– special measures for countries submitting their first satellite filing:

  – on an exceptional basis, special consideration could be given to countries submitting their first filing for a satellite system, taking into account the special needs of developing countries;

  – such consideration should take into account the following:

    – impact on other administrations;

    – satellite service of the system (i.e. FSS, MSS, BSS);

    – frequency band covered by the filing;

    – system is intended to meet the direct needs of the country(s) concerned;

– extension of the regulatory time-limit for bringing into use:

  – conditions could be specified under which extensions might be granted on an exceptional basis to developing countries when they are not able to complete the regulatory date requirements, so that sufficient time for design, construction and launch of satellite systems is made available;

  – the conditions created under the previous paragraph should be included in the Radio Regulations as provisions that would allow the Radiocommunication Bureau to grant the extension.

[2] This Report can be found in Addendum 5 to Document 4 to WRC-03.

RESOLUTION 86 (REV.WRC-07)

Implementation of Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference

The World Radiocommunication Conference (Geneva, 2007),

considering

a) that the Plenipotentiary Conference (Marrakesh, 2002) discussed the application of Resolution 86 (Minneapolis, 1998) and decided to request WRC-03 to determine the scope and criteria to be used by future world radiocommunication conferences (WRCs) in the application of Resolution 86 (Rev. Marrakesh, 2002);

b) that the Plenipotentiary Conference (Antalya, 2006) invited WRC-07 to consider Resolution 86 (Marrakesh, 2002) and to report the results to the 2010 Plenipotentiary Conference,

recognizing

that the Radio Regulations Board makes suggestions to transform the content of the Rules of Procedure into a regulatory text in accordance with Nos. **13.0.1** and **13.0.2** of Article **13** of the Radio Regulations,

noting

that administrations may also wish to make proposals to transform the content of the Rules of Procedure into a regulatory text for possible inclusion in the Radio Regulations,

resolves to invite future world radiocommunication conferences

1 to consider any proposals which deal with deficiencies and improvements in the advance publication, coordination, notification and recording procedures of the Radio Regulations for frequency assignments pertaining to space services which have either been identified by the Board and included in the Rules of Procedure or which have been identified by administrations or by the Radiocommunication Bureau, as appropriate;

2 to ensure that these procedures, and the related appendices of the Radio Regulations reflect the latest technologies, as far as possible,

invites administrations

to consider, in preparing for PP-10, appropriate action with regard to Resolution 86 (Rev. Marrakesh, 2002).

RESOLUTION 95 (REV.WRC-19)

General review of the Resolutions and Recommendations of world administrative radio conferences and world radiocommunication conferences

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that it is important to keep the Resolutions and Recommendations of past world administrative radio conferences (WARCs) and world radiocommunication conferences (WRCs) under constant review, in order to keep them up to date;

b) that the reports of the Director of the Radiocommunication Bureau submitted to previous conferences provided a useful basis for a general review of the Resolutions and Recommendations of past conferences;

c) that some principles and guidelines are necessary for future conferences to treat the Resolutions and Recommendations of previous conferences which are not explicitly related to the agenda of the conference,

resolves

that recommended agendas for future WRCs should include a standing agenda item to review the Resolutions and Recommendations of previous conferences that are not related to any other agenda item of the conference with a view to:

– abrogating those Resolutions and Recommendations that have served their purpose or have become no longer necessary;

– reviewing the need for those Resolutions and Recommendations, or parts thereof, requesting ITU Radiocommunication Sector (ITU-R) studies on which no progress has been made during the last two periods between conferences;

– updating and modifying Resolutions and Recommendations, or parts thereof, that have become out of date, and to correct obvious omissions, inconsistencies, ambiguities or editorial errors and effect any necessary alignment,

invites future competent world radiocommunication conferences

1 to review the Resolutions and Recommendations of previous conferences that are related to the agenda items of the conference, other than the standing agenda item mentioned in *resolves*, under those specific agenda items, with a view to their possible revision, replacement or abrogation, and to take appropriate action;

2 at the beginning of the conference, to determine which committee within the conference has the primary responsibility to review each of the Resolutions and Recommendations of previous conferences,

instructs the Director of the Radiocommunication Bureau

1 to conduct a general review of the Resolutions and Recommendations of previous conferences and, after consultation with the Radiocommunication Advisory Group and the chairmen and vice-chairmen of the radiocommunication study groups, submit a report to the second session of the Conference Preparatory Meeting (CPM) in respect of *resolves* and *invites future competent world radiocommunication conferences* 1, including an indication of any associated agenda items;

2 to include in the above report, with the cooperation of the chairmen of the radiocommunication study groups, the progress reports of ITU-R studies on the issues which have been requested by Resolutions and Recommendations of previous conferences but which are not placed on the agendas of the forthcoming two conferences,

invites administrations

to submit contributions on the implementation of this Resolution to the second session of CPM and the conference,

invites the Conference Preparatory Meeting

to include, in its Report, the results of the general review of the Resolutions and Recommendations of previous conferences, based on the contributions by administrations to the second session of CPM and the above-mentioned Report of the Director, in order to facilitate the follow-up by the conference.

RESOLUTION 155 (REV.WRC-19)

Regulatory provisions related to earth stations on board unmanned aircraft which operate with geostationary-satellite networks in the fixed-satellite service in certain frequency bands not subject to a Plan of Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems in non-segregated airspaces*

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the operation of unmanned aircraft systems (UAS) requires reliable control and non-payload communication (CNPC) links, in particular to relay air traffic control communications and for the remote pilot to control the flight;

b) that satellite networks may be used to provide CNPC links of UAS beyond the line-of-sight, as shown in Annex 1 to this Resolution;

c) that CNPC links between space stations and stations on board unmanned aircraft (UA) are proposed to be operated under this Resolution in the primary fixed-satellite service (FSS) in frequency bands shared with other primary services, including terrestrial services, however that would not preclude the use of other available allocations to accommodate this application,

considering further

that UAS CNPC links relate to the safe operation of UAS and have to comply with certain technical, operational and regulatory requirements,

noting

a) that WRC-15 adopted Resolution **156 (WRC-15)** on the use of earth stations in motion communicating with geostationary FSS space stations in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz;

b) that Report ITU-R M.2171 provides information on characteristics of UAS and spectrum requirements to support their safe operation in non-segregated airspace,

recognizing

a) that the UAS CNPC links will operate in accordance with international standards and recommended practices (SARPs) and procedures established in accordance with the Convention on International Civil Aviation;

* May also be used consistent with international standards and practices approved by the responsible civil aviation authority.

b) that, in this Resolution, conditions are provided for operations of CNPC links without prejudging whether the International Civil Aviation Organization (ICAO) would be able to develop SARPs to ensure safe operation of UAS under these conditions,

resolves

1 that assignments to stations of GSO FSS networks operating in the frequency bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.5 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Regions 1 and 3 and 19.7-20.2 GHz (space-to-Earth), and in the frequency bands 14-14.47 GHz (Earth-to-space) and 29.5-30.0 GHz (Earth-to-space), may be used for UAS CNPC links in non-segregated airspace*, provided that the conditions specified in *resolves* below are met;

2 that earth stations in motion on board UA may communicate with the space station of a GSO FSS network operating in the frequency bands listed in *resolves* 1 above, provided that the class of the earth station in motion on board UA is matched with the class of the space station and that other conditions of this Resolution are met (see also *instructs the Director of the Radiocommunication Bureau* 3 below);

3 that the frequency bands specified in *resolves* 1 shall not be used for the UAS CNPC links before the adoption of the relevant international aeronautical SARPs consistent with Article 37 of the Convention on International Civil Aviation, taking into account *instructs the Director of the Radiocommunication Bureau* 4;

4 that administrations responsible for an FSS network providing UA CNPC links shall apply the relevant provisions of Articles **9** (necessary provisions need to be identified or developed) and **11** for the relevant assignments, including, as appropriate, assignments to the corresponding space station, specific and typical earth station and earth station in motion on board UA, including the request for publication in the International Frequency Information Circular (BR IFIC) of items referred to in *resolves* 2 and the course of actions identified in that *resolves* in order to obtain international rights and recognition as specified in Article **8**;

5 that earth stations of UAS CNPC links shall operate within the notified and recorded technical parameters of the associated satellite network, including specific or typical earth stations of the GSO FSS network(s) as published by the Radiocommunication Bureau (BR);

6 that earth stations of UAS CNPC links shall not cause more interference to, or claim more protection from, other satellite networks and systems than specific or typical earth stations as indicated in *resolves* 5 as published by BR;

* May also be used consistent with international standards and practices approved by the responsible civil aviation authority.

7 that, in order to apply *resolves* 6 above, administrations responsible for the FSS network to be used for UAS CNPC links shall provide the level of interference for the reference assignments of the network used for CNPC links upon request by an administration authorizing the use of UAS CNPC links within its territory;

8 that earth stations of UAS CNPC links of a particular FSS network shall not cause more interference to, or claim more protection from, stations of terrestrial services than specific or typical earth stations of that FSS network as indicated in *resolves* 5 that have been previously coordinated and/or notified under relevant provisions of Articles **9** and **11**;

9 that the use of assignments of an FSS satellite network for UAS CNPC links shall not constrain other FSS networks during the application of the provisions of Articles **9** and **11**;

10 that the introduction of UAS CNPC links shall not result in additional coordination constraints on terrestrial services under Articles **9** and **11**;

11 that earth stations on board UA shall be designed and operated so as to be able to accept the interference caused by terrestrial services operating in conformity with the Radio Regulations in the frequency bands listed in *resolves* 1 without complaints under Article **15**;

12 that earth stations on board UA shall be designed and operated so as to be able to operate with interference caused by other satellite networks resulting from application of Articles **9** and **11**;

13 that, in order to ensure safety-of-flight operation of UAS, administrations responsible for operating UAS CNPC links shall:

– ensure that the use of UAS CNPC links be in accordance with international SARPs consistent with Article 37 of the Convention on International Civil Aviation;

– take the required measures, consistent with No. **4.10**, to ensure freedom from harmful interference to earth stations on board UA operated in accordance with this Resolution;

– act immediately when their attention is drawn to any such harmful interference, as freedom from harmful interference to UAS CNPC links is imperative to ensure their safe operation, taking into account *resolves* 11;

– use assignments associated with the FSS networks for UAS CNPC links (see Figure 1 in Annex 1), including assignments to space stations, specific or typical earth stations and earth stations on board UA (see *resolves* 2), that have been successfully coordinated under Article **9** (including provisions identified in *resolves* 4) and recorded in the Master International Frequency Register with a favourable finding under Article **11**, including Nos. **11.31**, **11.32** or **11.32A** where applicable, and except those assignments that have not successfully completed coordination procedures under No. **11.32** by applying Appendix **5** § 6.d.i;

– ensure that real-time interference monitoring, estimation and prediction of interference risks and planning solutions for potential interference scenarios are addressed by FSS operators and UAS operators with guidance from aviation authorities;

14 that, unless otherwise agreed between the administrations concerned, UA CNPC earth stations shall not cause harmful interference to terrestrial services of other administrations (see also Annex 2 to this Resolution);

15 that, in order to implement *resolves* 14 above, power flux-density (pfd) hard limits need to be developed for UAS CNPC links; possible examples of such provisional limits to protect the fixed service are provided in Annex 2; subject to agreement between the administrations concerned, that annex may be used for the implementation of this Resolution;

16 that the pfd hard limits provided in Annex 2 shall be reviewed and, if necessary, revised by WRC-23[1];

17 that, in order to protect the radio astronomy service in the frequency band 14.47-14.5 GHz, administrations operating UAS in accordance with this Resolution in the frequency band 14-14.47 GHz within line-of-sight of radio astronomy stations are urged to take all practicable steps to ensure that the emissions from the UA in the frequency band 14.47-14.5 GHz do not exceed the levels and percentage of data loss given in the most recent versions of Recommendations ITU-R RA.769 and ITU-R RA.1513;

18 to consider the progress obtained by ICAO in the process of preparation of SARPs for UAS CNPC links, to review this Resolution at WRC-23, taking into account the results of the implementation of Resolution **156 (WRC-15)**, and to take necessary actions as appropriate;

19 that the ITU Radiocommunication Sector (ITU-R) studies on technical, operational and regulatory aspects in relation to the implementation of this Resolution shall be completed, together with the adoption of relevant ITU-R Recommendations defining the technical characteristics of CNPC links and conditions of sharing with other services,

encourages administrations

1 to provide the relevant information where available in order to facilitate the application of *resolves* 6;

2 to participate actively in the studies referred to in *invites the ITU Radiocommunication Sector* by submitting contributions to ITU-R,

invites the 2023 World Radiocommunication Conference

to consider the results of the above studies referred to in this Resolution with a view to reviewing and, if necessary, revising this Resolution, and take necessary actions, as appropriate,

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[1] WRC-19 received a proposal from one regional organization regarding protection of the fixed service using a revised pfd mask as contained in Annex 2 section b). ITU-R is invited, in continuing its study on the implementation of this Resolution, to consider this mask and take necessary action as appropriate.

invites the ITU Radiocommunication Sector

to conduct, as a matter of urgency, relevant studies of technical, operational and regulatory aspects in relation to the implementation of this Resolution[1],

instructs the Director of the Radiocommunication Bureau

1 to examine the relevant part of this Resolution requiring actions to be taken by administrations to implement this Resolution, with a view to sending it to administrations and posting it on the ITU website;

2 to present to subsequent WRCs a progress report relating to the implementation of this Resolution;

3 to define a new class of station in order to be able to process satellite network filings submitted by administrations for earth stations providing UA CNPC links, after the Resolution is implemented, in accordance with this Resolution, and publish the information as referred to in *resolves* 4;

4 not to process satellite network filing submissions by administrations with a new class of a station for earth stations providing UA CNPC links before *resolves* 1-12 and 14-19 of this Resolution are implemented;

5 to report to subsequent WRCs on the progress made by ICAO on the development of SARPs for UAS CNPC links,

instructs the Secretary-General

to bring this Resolution to the attention of the Secretary General of ICAO,

invites the International Civil Aviation Organization

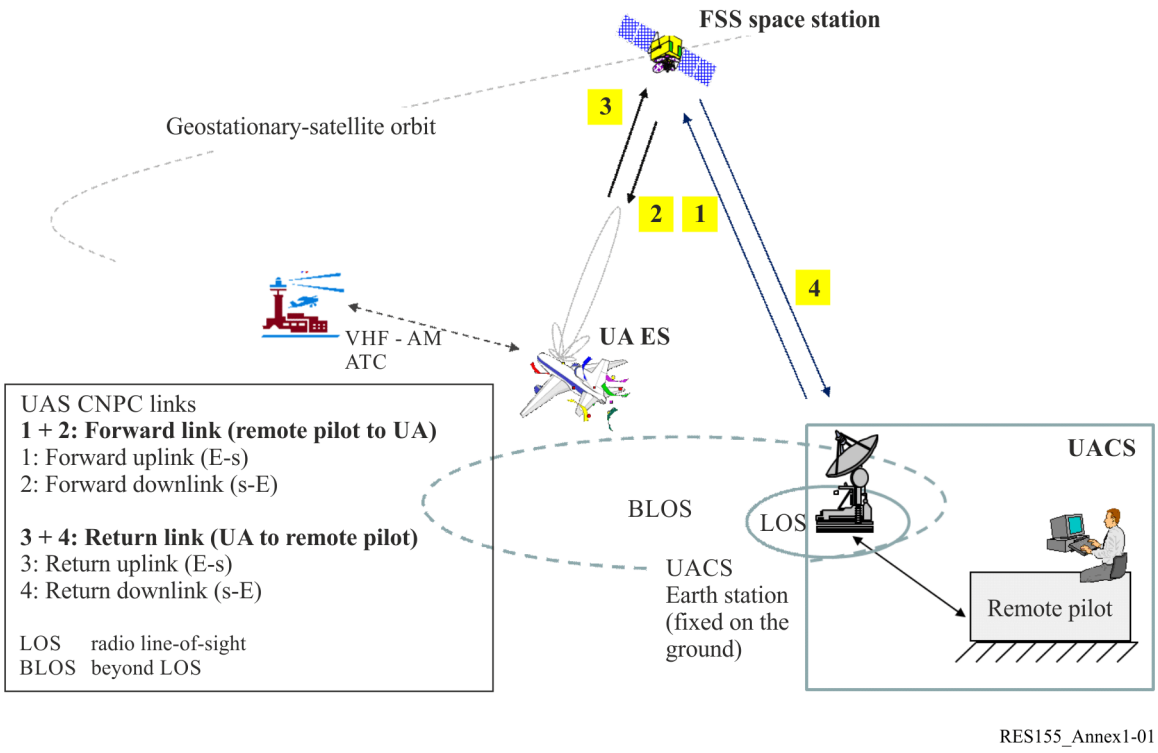
to provide to the Director of BR, in time for WRC-23, information on ICAO efforts regarding implementation of UAS CNPC links, including the information related to the development of SARPs for UAS CNPC links.

ANNEX 1 TO RESOLUTION 155 (REV.WRC-19)

UAS CNPC links

FIGURE 1

Elements of UAS architecture using the FSS



ANNEX 2 TO RESOLUTION 155 (REV.WRC-19)

Protection of the fixed service from UAS CNPC emissions

a) Example provided to WRC-15

The fixed service is allocated by table entries and footnotes in several countries with co-primary status with FSS. Conditions of UA using CNPC shall be such that the fixed service is protected from any harmful interference as follows:

An earth station on board UA in the frequency band 14.0-14.47 GHz shall comply with provisional power flux-density (pfd) limits described below:

$$-132 + 0.5 \cdot \theta \quad \text{dB}(\text{W}/(\text{m}^2 \cdot \text{MHz})) \quad \text{for} \quad 0° \leq \theta \leq 40°$$

$$-112 \quad \text{dB}(\text{W}/(\text{m}^2 \cdot \text{MHz})) \quad \text{for} \quad 40° < \theta \leq 90°$$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

NOTE – The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.

b) Example provided to WRC-19

An earth station on board UA in the frequency band 14.0-14.3 GHz shall comply with the pfd limits described below, on the territory of countries listed in No. **5.505**:

$$15\log(\theta+0.9)-124 \text{ dB}\left(\text{W}/\left(\text{m}^2\cdot\text{MHz}\right)\right) \quad \text{for } 0^\circ \le \theta \le 90^\circ$$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

An earth station on board UA:

– in the frequency band 14.25-14.3 GHz on the territory of countries listed in No. **5.508**;

– in the frequency band 14.3-14.4 GHz in Regions 1 and 3;

– in the frequency band 14.4-14.47 GHz worldwide,

shall comply with the pfd limits described below:

$$15\log(\theta+0.9)-133.5\text{dB}\left(\text{W}/\left(\text{m}^2\cdot\text{MHz}\right)\right) \quad \text{for } 0^\circ \le \theta \le 90^\circ$$

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizontal).

NOTE – The aforementioned limits relate to the pfd and angles of arrival that would be obtained under free-space propagation conditions.

RESOLUTION 171 (WRC-19)

Review and possible revision of Resolution 155 (Rev.WRC-19) and No. 5.484B in the frequency bands to which they apply

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the operation of unmanned aircraft systems (UAS) requires reliable control and non-payload communication (CNPC) links, in particular to relay air traffic control communications and for the remote pilot to control the flight, and that satellite networks may be used to provide these CNPC links beyond line-of-sight;

b) that UAS CNPC links relate to the safe operation of UAS and have to comply with certain technical and regulatory requirements, and will operate in accordance with international Standards and Recommended Practices (SARPs) and procedures established in accordance with the Convention on International Civil Aviation;

c) that the International Civil Aviation Organization (ICAO) is developing SARPs to ensure the technical aspects of using fixed-satellite service (FSS) satellites to support safe and reliable UAS CNPC links;

d) that there is urgency to conclude on the feasibility of use of the FSS frequency bands identified by Resolution **155 (Rev.WRC-19)** to support the safe implementation of UAS CNPC links in non-segregated airspace;

e) that the ITU Radiocommunication Sector (ITU-R) has made substantive progress on studies of technical, operational and regulatory aspects in relation to the implementation of Resolution **155 (Rev.WRC-19)**,

recognizing

a) that *invites the 2023 World Radiocommunication Conference* in Resolution **155 (Rev.WRC-19)** requests the 2023 World Radiocommunication Conference to consider the results of ITU-R studies referred to in Resolution **155 (Rev.WRC-19)** with a view to reviewing and, if necessary, revising Resolution **155 (Rev.WRC-19)**, and take necessary actions, as appropriate;

b) that, under No. **5.484B** adopted at WRC-15, reference is made to Resolution **155 (WRC-15)** in the Table of Frequency Allocations;

c) that the technical, operational and coordination conditions and processes for operation within FSS networks are to be maintained in any modifications of Resolution **155 (Rev.WRC-19)**;

d) that ICAO is responsible for defining the appropriate criteria and mitigation techniques, taking into account the safety-of-life aspects of the CNPC links, in order to operate UAS under the FSS in non-segregated airspace,

resolves to invite the ITU Radiocommunication Sector

1 to continue and complete in time for WRC-23 relevant studies of the technical, operational and regulatory aspects, based on the frequency bands mentioned in *resolves* 1 of Resolution **155 (Rev.WRC-19)**, in relation to the implementation of Resolution **155 (Rev.WRC-19)**, taking into account the progress obtained by ICAO in the completion of SARPs on use of the FSS for the UAS CNPC links;

2 to review No. **5.484B** and Resolution **155 (Rev.WRC-19)** taking into account the results of the above studies,

invites the 2023 World Radiocommunication Conference

to revise, if necessary, No. **5.484B** and Resolution **155 (Rev.WRC-19)** and take other necessary actions, as appropriate, on the basis of the studies conducted under Resolution **155 (Rev.WRC-19)** and *resolves to invite the ITU Radiocommunication Sector* above,

instructs the Secretary-General

to bring this Resolution to the attention of the Secretary-General of ICAO.

RESOLUTION 172 (WRC-19)

Operation of earth stations on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service in the frequency band 12.75-13.25 GHz (Earth-to-space)

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that WARC Orb-88 created an allotment Plan for the use of 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;

b) that WRC-07 revised the regulatory regime governing the use of the frequency bands referred to in *considering a)* above;

c) that the frequency band 12.75-13.25 GHz is currently allocated on a primary basis to the fixed, fixed-satellite (FSS) (Earth-to-space) and mobile services, and on a secondary basis to the space research (deep space) (space-to-Earth) service globally;

d) that the frequency band 12.75-13.25 GHz is used by the geostationary-satellite (GSO) FSS in accordance with the provisions of Appendix 30B (No. 5.441) and there are many existing GSO FSS satellite networks operating in this frequency band;

e) that the frequency bands in the space-to-Earth direction corresponding to the frequency band referred to in *considering d)* are the frequency bands 10.7-10.95 GHz and 11.2-11.45 GHz, which may be used by earth stations on aircraft and vessels, subject to not claiming protection from other applications of the FSS as well as other radiocommunication services to which the frequency band is allocated;

f) that the frequency band 10.6-10.7 GHz is allocated to the Earth exploration-satellite service (EESS) (passive);

g) that the availability of the frequency band 12.75-13.25 GHz (Earth-to-space) for earth stations on aircraft and vessels could provide administrations with more flexibility to use their allotments in the Appendix 30B Plan, restricted to national territory;

h) that there is an increased need for in-flight and maritime connectivity which can be partially satisfied by allowing earth stations on aircraft and vessels to communicate with GSO space stations in the FSS, including in the frequency band 12.75-13.25 GHz (Earth-to-space);

i) that advances in technology, including the use of tracking techniques, allow earth stations on aircraft and vessels to operate within the characteristics of fixed earth stations of the FSS;

j) that the use of the frequency band 12.75-13.25 GHz (Earth-to-space) for links of earth stations on aircraft and vessels operating to GSO FSS satellite networks could contribute as an additional use of the spectrum and enhance broadband communications for passengers, and is not to be used or relied upon for safety-of-life applications,

considering further

a) that there is no methodology on how to protect neighbouring space stations of Appendix **30B** from earth stations on aircraft and vessels communicating with a GSO FSS space station;

b) that there is no information on coordination agreements reached among administrations regarding GSO FSS satellite networks;

c) that there is no established and agreed interference management procedure to address the potential interference arising from the use of earth stations on aircraft and vessels referred to in this Resolution, and the responsibility of the entities involved in this operation is not defined,

noting

a) that Resolution **156 (WRC-15)** addresses the use of earth stations in motion (ESIMs) communicating with GSO space stations in the FSS in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz;

b) that Resolution **158 (WRC-15)**[*] calls for studies for the use of ESIMs communicating with GSO space stations in the FSS in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz;

c) that this conference has adopted Resolution **169 (WRC-19)**, which contains the regulatory conditions regarding ESIMs communicating with GSO FSS networks in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz under conditions contained in that Resolution;

d) that this conference has adopted Resolution **170 (WRC-19)**, which provides the procedure to ensure equitable access to frequency bands under Appendix **30B** by developing countries,

recognizing

a) that the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels shall not result in any changes or restrictions to the existing Plan allotments and List assignments made under the Appendix 30B;

b) that the technical characteristics of earth stations on aircraft and vessels communicating with a GSO space station in the FSS shall comply with the envelope defined in Appendix 30B and/or with the coordination agreements reached between administrations;

c) that the current usage and future development of the allocated services in the frequency band 12.75-13.25 GHz (Earth-to-space) shall be protected without imposing additional constraints on them;

[*] *Note by the Secretariat*: This Resolution was abrogated by WRC-19.

d) that, in the frequency bands referred to in *considering e)*, use by earth stations on aircraft and vessels would be for reception and therefore not cause interference;

e) that for the frequency bands referred to in *considering e)*, earth stations on aircraft and vessels shall not impose constraints on other allocated services nor claim protection from allocated services operating in accordance with the Radio Regulations;

f) that the transmitting GSO space station communicating with earth stations on aircraft and vessels should protect the adjacent EESS (passive) operations referred to in *considering f)* in accordance with No. **5.340**;

g) that administrations intending to operate earth stations on aircraft and vessels in Appendix **30B** frequency bands shall submit a commitment to ITU to undertake to immediately eliminate unacceptable interference or reduce it to an acceptable level should such interference be caused to terrestrial services;

h) that a worldwide harmonized approach for earth stations on aircraft and vessels would benefit the administrations as well as industries;

i) that Appendix 30B requires the notifying administration to obtain the specific agreement of other administrations via Article 6 (§§ 6.6 and 6.16) regarding the inclusion of their territory in the service area of the satellite network;

j) that there are established criteria in Annex 4 to Appendix **30B** comprising single-entry and aggregate values to protect Appendix **30B** assignments;

k) that Article 44 of the ITU Constitution lays down the basic principles for the use of the radio-frequency spectrum and the GSO and other satellite orbits, taking into account the needs of developing countries;

l) that the "first-come first-served" concept can restrict and sometimes prevent access to and use of certain frequency bands and orbital positions;

m) that Resolution **2 (Rev.WRC-03)** resolves that "the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems by other countries",

recognizing further

that information provided by the Radiocommunication Bureau (BR) in ITU Radiocommunication Sector (ITU-R) studies indicates that a very significant number of Appendix **30B** submissions have been received by BR in the time period 1 January 2013 until 22 November 2019 and that the table provided in *recognizing further a)* of Resolution **170 (WRC-19)** summarizes the data provided by BR into those studies and shows the variations for the number of networks at the various stages,

resolves

that earth stations on aircraft and vessels addressed by this Resolution:

a) shall not be used or relied upon for safety-of-life applications;

b) shall not result in changes or restrictions to the existing Plan allotments and List assignments made under the Appendix 30B, and their future development,

invites the ITU Radiocommunication Sector

1 to study the technical and operational characteristics and user requirements of earth stations on aircraft and vessels that communicate or plan to communicate with GSO space stations in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space) under the envelope of Appendix **30B** Article 6 recorded in the List or the Master International Frequency Register (MIFR) with favourable finding only, and to examine related existing regulatory provisions, subject to *recognizing a)*;

2 to study the sharing and compatibility issues between earth stations on aircraft and vessels communicating with GSO space stations in the FSS and current and planned stations of existing services referred to in *considering c)* as well as services in adjacent frequency bands, to ensure protection of, and not impose undue constraints on, those services and their future development, taking into account the provisions of Appendix **30B**;

3 to study the responsibility of the entities involved in the operation of the earth stations on aircraft and vessels addressed by this Resolution;

4 to develop the criteria to ensure that earth stations on aircraft and vessels, as a new FSS application in this frequency band, shall not claim more protection or cause more interference than filed earth stations in Appendix **30B**;

5 to develop the technical conditions and regulatory provisions for the harmonized operation of earth stations on aircraft and vessels communicating with GSO space stations in the FSS operating in the frequency band 12.75-13.25 GHz (Earth-to-space), considering the results of the studies outlined in *invites the ITU Radiocommunication Sector* 1 and 2, and in particular without affecting the Appendix 30B Plan;

6 to ensure that the operation of earth stations on aircraft and vessels in the frequency band 12.75-13.25 GHz under Appendix **30B** shall not adversely affect the criteria referred to in *recognizing j)*, including the cumulative effect of multiple earth stations on aircraft and vessels;

7 to ensure that the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by earth stations on aircraft and vessels shall not limit the access of other administrations to their national resources in Appendix 30B as well as implementation of Resolution **170 (WRC-19)**;

8 to ensure that the use of earth stations on aircraft and vessels addressed by this Resolution would not result in any additional status than that of the GSO network with which these stations communicate;

9 to ensure that the results of ITU-R studies are agreed by Member States taking into account the required consensus on this matter;

10 to complete studies in time for WRC-23,

invites the 2023 World Radiocommunication Conference

to consider the results of the above studies in *invites the ITU Radiocommunication Sector* and take necessary actions, as appropriate,

invites administrations

to participate actively in the studies by submitting contributions to ITU-R.

RESOLUTION 173 (WRC-19)

Use of the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by earth stations in motion communicating with non-geostationary space stations in the fixed-satellite service

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) are globally allocated on a co-primary basis to the fixed-satellite service (FSS), and that there are a number of non-geostationary-satellite systems (non-GSO) operating or planned to operate in these frequency bands;

b) that the fixed and mobile services are allocated on a primary basis in the frequency bands 17.7-17.8 GHz, 18.1-19.7 GHz and 27.5-29.5 GHz on a global basis* and the fixed service is also allocated on a primary basis in the frequency band 17.8-18.1 GHz on a global basis;

c) that the frequency band 28.5-30 GHz (Earth-to-space) is allocated to the Earth exploration-satellite service (EESS) on a secondary basis, and no additional constraints should be imposed on the EESS;

d) that the frequency band 29.95-30 GHz may be used for space-to-space links in the EESS on a secondary basis, and no additional constraints should be imposed on the EESS;

e) that there are existing and planned non-GSO satellite constellations in the frequency bands 17.7-20.2 GHz (space-to-Earth) and 27.5-30 GHz (Earth-to-space) and that these constellations are designed to serve the growing need for access to broadband connectivity, regardless of location;

f) that existing regulatory and technical procedures apply in the segments of the frequency bands listed in *considering a)* between geostationary-satellite (GSO) FSS networks and non-GSO FSS systems;

g) that the frequency bands listed in *considering a)* are also allocated to several other services on a primary basis, that those services are used by a variety of different systems in many administrations and that these existing services and their future development should be protected without undue constraints;

h) that, in accordance with the relevant provisions of Articles **9** and **11**, non-GSO FSS networks intending to operate in the frequency bands detailed in *considering a)* should be coordinated and notified;

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* *Note by the Secretariat*: The band 17.7-17.8 GHz is allocated to the mobile service on a secondary basis in Region 2.

i) that there is a need for mobile-satellite communications, including global satellite broadband, and that part of this need can be met by allowing earth stations in motion (ESIMs) to communicate with FSS space stations operating in the frequency bands detailed in *considering a)*;

j) that a consistent approach to the deployment of these ESIMs will support important and growing global communication requirements and provide adequate protection to other services in the frequency bands;

k) that, currently, there is no specific regulatory procedure for the coordination of ESIMs relative to terrestrial stations for these services,

considering further

a) that there is no methodology on how to protect GSO FSS space stations from ESIMs communicating with non-GSO FSS systems;

b) that there is no information on the coordination agreements reached among administrations between GSO FSS satellite networks and non-GSO FSS systems in those frequency bands where No. **5.523A** applies;

c) that there is no established and agreed interference management procedure to address the potential interference arising from the use of ESIMs communicating with non-GSO FSS systems referred to in this Resolution, and the responsibility of the entities involved in this operation is not defined;

d) that ESIMs communicating with non-GSO FSS systems should be operated within the envelope of the characteristics and envelope of coordination of specific and/or typical earth stations of the non-GSO FSS systems initially published and included in the International Frequency Information Circular (BR IFIC);

e) that there is no established methodology to calculate the equivalent power flux-density (epfd) from the use of multiple non-GSO FSS systems in the frequency bands detailed in *considering a)*,

noting

a) that Resolution **156 (WRC-15)** addresses the use of ESIMs communicating with GSO space stations in the FSS in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz;

b) that Resolution **158 (WRC-15)**[*] calls for studies for the use of ESIMs communicating with GSO space stations in the FSS in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz;

c) that this conference has adopted Resolution **169 (WRC-19)**, which contains the technical, operational and regulatory provisions for ESIMs communicating with GSO FSS networks in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz, under the conditions contained in that Resolution,

[*] *Note by the Secretariat*: This Resolution was abrogated by WRC-19.

recognizing

a) that technical and operational requirements for ESIMs, which prior to WRC-15 were referred to as earth stations on mobile platforms ("ESOMPs") operating with non-GSO FSS systems in the frequency bands detailed in *considering a)* above have been discussed in the ITU Radiocommunication Sector (ITU-R) and are reflected in the Report ITU-R S.2261;

b) that Article **21** determines power flux-density (pfd) limits applicable to non-GSO FSS systems to protect fixed and mobile land stations;

c) that Article **22** contains epfd limits for non-GSO FSS systems in the frequency bands 17.8-18.6 GHz, 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30 GHz (Earth-to-space) and 17.8-18.4 GHz (inter-satellite);

d) that the use of the frequency band 19.3-19.6 GHz (Earth-to-space) by the FSS is limited to GSO systems and feeder links to non-GSO systems in the mobile-satellite service (MSS), in accordance with No. **5.523D**;

e) that the use of the frequency band 29.1-29.5 GHz (Earth-to-space) by the FSS is limited to GSO systems and feeder links to non-GSO systems in the MSS, in accordance with No. **5.535A**;

f) that WRC-15 adopted No. **5.527A** and Resolution **156 (WRC-15)** related to ESIMs that communicate with GSO satellites;

g) that advances in technology, including the use of tracing techniques, allow ESIMs to operate according to the characteristics of typical FSS earth stations;

h) that t*hese earth stations are not be used or relied upon for safety-of-life applications;*

i) that the frequency band 18.6-18.8 GHz is allocated to the EESS (passive) and space research service (SRS) (passive),

recognizing further

a) that segments of the frequency band 17.7-18.1 GHz are used by feeder links for the broadcasting-satellite service (BSS), subject to Appendix **30A** (No. **5.516**);

b) that the frequency bands 18.3-19.3 GHz (Region 2), 19.7-20.2 GHz (all regions), 27.5-27.82 GHz (Region 1), 28.35-28.45 GHz (Region 2), 28.45-28.94 GHz (all regions), 28.94-29.1 GHz (Regions 2 and 3), 29.25-29.46 GHz (Region 2) and 29.465-30.0 GHz (all regions) have been identified for use in high-density applications in the FSS (No. **5.516B**);

c) that the use of the frequency band 18.1-18.4 GHz by the FSS (Earth-to-space) is limited to feeder links of GSO BSS systems (No. **5.520**);

d) that the use of the frequency bands 17.8-18.6 GHz, 19.7-20.2 GHz, 27.5-28.6 GHz and 29.5-30.0 GHz by non-GSO FSS systems is subject to the applicable provisions of Nos. **5.484A**, **22.5C** and **22.5I**;

e) that the use of the frequency bands 18.8-19.3 GHz and 28.6-29.1 GHz by GSO and non-GSO FSS networks is subject to the applicable provisions of No. **9.11A**, while No. **22.2** does not apply (No. **5.523A**);

f) that the use of the frequency band 19.3-19.7 GHz by GSO FSS systems and feeder links of non-GSO MSS systems is subject to the applicable provisions of No. **9.11A**, but not to the provisions of No. **22.2**; in addition, the use of this frequency band by other non-GSO FSS systems or for the cases indicated in Nos. **5.523C** and **5.523E** is not subject to the provisions of No. **9.11A**, and shall continue to be subject to the procedures of Article **9** (except No. **9.11A**) and Article **11**, and to the provisions of No. **22.2** (No. **5.523D**);

g) that the frequency bands 27.5-29.1 GHz and 29.5-30.0 GHz may be used by the FSS (Earth-to-space) to provide feeder links in the BSS (No. **5.539**);

h) that all allocated services in the frequency bands referred to in *considering a)* to *e)* should be taken into account when conducting sharing and compatibility studies;

i) that the notifying administrations of those non-GSO FSS systems with which ESIMs in the frequency bands detailed in *considering a)* above are intended to operate should submit a commitment to ITU to undertake to immediately eliminate unacceptable interference or reduce it to an acceptable level should such interference be caused to terrestrial services;

j) that Resolution **2 (Rev.WRC-03)** resolves that "the registration with the Radiocommunication Bureau of frequency assignments for space radiocommunication services and their use do not provide any permanent priority for any individual country or groups of countries and do not create an obstacle to the establishment of space systems by other countries",

resolves to invite the ITU Radiocommunication Sector

1 to study the technical and operational characteristics and user requirements of the different types of ESIMs that plan to operate within non-GSO FSS systems in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space), or parts thereof;

2 to study sharing and compatibility between ESIMs operating with non-GSO FSS systems and current and planned stations of primary services allocated in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space), or parts thereof, to ensure protection of, and not impose additional constraints on, GSO systems and other services, including terrestrial services, in those frequency bands and in adjacent frequency bands, including passive services;

3 to develop the technical and regulatory provisions for the operation of aeronautical and maritime ESIMs with non-GSO FSS systems, taking into account the results of studies under *resolves to invite the ITU Radiocommunication Sector* 1 and 2;

4 to ensure that the technical and operational measures and the possible regulatory changes established in accordance with this Resolution shall not affect the relevant provisions related to the protection of GSO networks from non-GSO FSS systems;

5 to ensure that the results of ITU-R studies are agreed by Member States by consensus;

6 to complete the studies in time for WRC-23,

invites the 2023 World Radiocommunication Conference

to review the results of these studies and take appropriate action.

RESOLUTION 174 (WRC-19)

Primary allocation to the fixed-satellite service in the space-to-Earth direction in the frequency band 17.3-17.7 GHz in Region 2

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) the need to encourage the development and implementation of new technologies in the fixed-satellite service (FSS) for broadband applications;

b) that FSS systems based on the use of new technologies associated with geostationary-satellite systems are capable of providing high-capacity and low-cost means of broadband communication even to the most isolated regions of the world;

c) that the Radio Regulations should enable the introduction of new applications of radiocommunication technology to ensure the operation of as many systems as possible in order to ensure efficient use of the spectrum;

d) that the frequency band 17.3-17.7 GHz is allocated in Region 2 on a primary basis to the broadcasting-satellite service (BSS) (space-to-Earth) and to the FSS (Earth-to-space), subject to the application of No. **5.516**,

recognizing

the need to preserve and protect frequencies subject to the application of Appendix **30A**,

noting

a) that technology has been developed to provide more efficient use of the spectrum;

b) that sharing of FSS (Earth-to-space) and FSS (space-to-Earth) is already considered in Region 1 for the frequency band 17.3-17.7 GHz;

c) that there is no other primary service in the frequency band 17.3-17.7 GHz apart from the FSS and the BSS,

resolves

that the studies referred in *invites the ITU Radiocommunication Sector* below shall protect radiocommunication services to which the frequency band is allocated on primary basis, in particular assignments contained in Appendix **30A**,

invites the ITU Radiocommunication Sector

to conduct, and complete in time for WRC-23, sharing and compatibility studies between the FSS (space-to-Earth) and the BSS (space-to-Earth) and between the FSS (space-to-Earth) and the FSS (Earth-to-space), in order to consider a possible new primary allocation to the FSS (space-to-Earth) in the frequency band 17.3-17.7 GHz for Region 2, while ensuring the protection of existing primary allocations in the same and adjacent frequency bands, as appropriate, and without imposing any additional constraints on existing allocations to the BSS (space-to-Earth) and the FSS (Earth-to-space),

invites the 2023 World Radiocommunication Conference

to consider the results of the above studies and take necessary actions, as appropriate,

invites administrations

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to the ITU Radiocommunication Sector.

RESOLUTION 175 (WRC-19)

Use of International Mobile Telecommunications systems for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the use of harmonized frequency bands for International Mobile Telecommunications (IMT) systems is desirable in order to achieve the benefits of economies of scale worldwide;

b) that the use of IMT systems for fixed broadband can assist in meeting global demands to bridge the digital divide, support the broadband agenda in developing countries and provide cost-effective broadband services to rural and underserved areas,

recognizing

a) that Resolution 139 (Rev. Dubai, 2018) of the ITU Plenipotentiary Conference calls for bridging the digital divide worldwide through the use of telecommunications/information and communication technologies to bridge the digital divide and build an inclusive information society;

b) that Resolution 37 (Rev. Buenos Aires, 2017) of the World Telecommunication Development Conference calls for bridging the digital divide;

c) that the ITU Radiocommunication Sector (ITU-R) Handbook on fixed wireless access addresses the use of IMT systems for fixed wireless access, and Recommendation ITU-R M.819 contains specific requirements pertaining to fixed wireless access,

resolves to invite the ITU Radiocommunication Sector

to conduct any necessary studies on the use of IMT systems for fixed wireless broadband in the frequency bands allocated to the fixed service on primary basis, taking into account the relevant ITU-R studies, Handbooks, Recommendations and Reports,

instructs the Director of the Radiocommunication Bureau

to report to WRC-23 on the results of these studies,

invites administrations

to participate in these studies in the process of preparation for WRC-23.

RESOLUTION 176 (WRC-19)

Use of the frequency bands 37.5-39.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by aeronautical and maritime earth stations in motion communicating with geostationary space stations in the fixed-satellite service

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) are globally allocated on a primary basis to the fixed-satellite service (FSS);

b) that there is an increasing need for mobile communications, including global broadband satellite services, and that some of this need can be met by allowing aeronautical and maritime earth stations in motion (ESIMs) to communicate with FSS space stations operating in the frequency bands 37.5-40.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space);

c) that in the FSS, there are geostationary-satellite (GSO) networks operating and/or planned for near-term operation in the frequency bands allocated to the FSS in the frequency range 37.5-51.4 GHz;

d) that some administrations have already deployed, and plan to expand their use of, ESIMs with operational and future GSO FSS networks;

e) that GSO FSS networks in the frequency bands 37.5-39.5 GHz (space-to-Earth), 40.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) are required to be coordinated and notified in accordance with the provisions of Articles **9** and **11**;

f) that the frequency bands 37.5-39.5 GHz, 40.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz are also allocated to several other services on a primary basis, the allocated services are used by a variety of different systems in many administrations, and these existing services and their future development should be protected without undue constraints;

g) the need to encourage the development and implementation of new technologies in the FSS at frequencies above 30 GHz,

recognizing

a) that Article **21** contains power flux-density (pfd) limits for GSO FSS;

b) that advances in technology, including the use of tracking techniques, allow ESIMs to operate within the characteristics of fixed earth stations of the FSS;

c) that WRC-15 adopted No. **5.527A** and Resolution **156 (WRC-15)** related to ESIMs;

d) that ESIMs addressed by this Resolution are not to be used for safety-of-life applications;

e) that the frequency bands 40.5-42 GHz (space-to-Earth) in Region 2, 47.5-47.9 GHz (space-to-Earth) in Region 1, 48.2-48.54 GHz (space-to-Earth) in Region 1, 49.44-50.2 GHz (space-to-Earth) in Region 1 and 48.2-50.2 GHz (Earth-to-space) in Region 2 are identified for use by high-density applications in the FSS (No. **5.516B**);

f) that the frequency bands 37-40 GHz, 40.5-43.5 GHz are available for high-density applications in the fixed service (No. **5.547**);

g) that the pfd in the frequency band 42.5-43.5 GHz produced by any GSO space station in the FSS (space-to-Earth) or the broadcasting-satellite service (BSS) operating in the frequency band 42-42.5 GHz shall not exceed, at the site of any radio astronomy station, the values listed in No. **5.551I**;

h) that the allocation of the spectrum for the FSS in the frequency bands 42.5-43.5 GHz and 47.2-50.2 GHz for Earth-to-space transmission is greater than that in the frequency band 37.5-39.5 GHz for space-to-Earth transmission in order to accommodate feeder links to broadcasting satellites, and administrations are urged to take all practicable steps to reserve the frequency band 47.2-49.2 GHz for feeder links for the BSS operating in the frequency band 40.5-42.5 GHz (No. **5.552**);

i) that the allocation to the fixed service in the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz is designated for use by high-altitude platform stations, and the use of the frequency bands 47.2-47.5 GHz and 47.9-48.2 GHz is subject to the provisions of Resolution **122 (Rev.WRC-19)** (No. **5.552A**);

j) that the use of the frequency bands 47.5-47.9 GHz, 48.2-48.54 GHz and 49.44-50.2 GHz by the FSS (space-to-Earth) is limited to GSO satellites (No. **5.554A**);

k) that the pfd in the frequency band 48.94-49.04 GHz produced by any GSO space station in the FSS (space-to-Earth) operating in the frequency bands 48.2-48.54 GHz and 49.44-50.2 GHz shall not exceed −151.8 dB(W/m^2) in any 500 kHz band at the site of any radio astronomy station (No. **5.555B**);

l) that, in the frequency bands 49.7-50.2 GHz, 50.4-50.9 GHz and 51.4-52.6 GHz, Resolution **750 (Rev.WRC-19)** applies, and Nos. **5.338A**, **5.340** and **5.340.1** apply among other provisions of the Radio Regulations;

m) that the fixed and mobile services are allocated on a primary basis in the frequency bands 37.5-42.5 GHz and 47.2-50.2 GHz on a global basis;

n) that the frequency band 37.5-38 GHz is allocated to the space research service (SRS) (deep space) in the space-to-Earth direction and the frequency band 40.0-40.5 GHz is allocated to the SRS and the Earth exploration-satellite service (EESS) in the Earth-to-space direction on a primary basis;

o) that the frequency bands 37.5-40.5 GHz and 38-39.5 GHz are also allocated to the EESS in the space-to-Earth direction on a secondary basis;

p) that the frequency band 50.2-50.4 GHz is allocated on a primary basis to the EESS (passive) and SRS (passive), which need to be adequately protected;

q) that all allocated services in these frequency bands should be taken into account,

resolves to invite the ITU Radiocommunication Sector

1 to study the technical and operational characteristics of aeronautical and maritime ESIMs that plan to operate within GSO FSS allocations in the frequency bands 37.5-39.5 GHz, 40.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz;

2 to study sharing and compatibility between aeronautical and maritime ESIMs operating with GSO FSS networks in the frequency bands 37.5-39.5 GHz, 40.5-42.5 GHz, 47.2-50.2 GHz[*] and 50.4-51.4 GHz[*] and current and planned stations of existing services allocated in these frequency bands and, where appropriate, in adjacent frequency bands, in order to ensure protection of, and not impose undue constraints on, those services;

3 to develop, for different types of ESIM, technical conditions and regulatory provisions for their operation, taking into account the results of the studies above,

invites the 2027 World Radiocommunication Conference

to consider the results of the above studies and take necessary actions, as appropriate, provided that the results of the studies referred to in *resolves to invite the ITU Radiocommunication Sector* are complete and agreed by the radiocommunication study groups.

[*] For the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz, sharing and compatibility studies for aeronautical ESIM should take into account all necessary steps to protect the terrestrial services to which the frequency band is allocated to.

RESOLUTION 177 (WRC-19)

Studies relating to spectrum needs and possible allocation of the frequency band 43.5-45.5 GHz to the fixed-satellite service

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that satellite systems are increasingly being used to deliver broadband services and can help enable universal broadband access;

b) that next-generation fixed-satellite service (FSS) technologies for broadband will increase speeds (45 Mbit/s is already available), with faster rates expected in the near future;

c) that technological developments such as advances in spot-beam technologies and frequency reuse are used by the FSS in spectrum above 30 GHz to increase the efficient use of spectrum;

d) that fixed-satellite applications in spectrum above 30 GHz, such as gateways, should be easier to share with other radiocommunication services than high-density fixed-satellite service applications;

e) that FSS systems based on the use of new technologies above 30 GHz and associated with both geostationary and non-geostationary satellite constellations are capable of providing high-capacity and economically feasible communications even to the most isolated regions of the world,

noting

that the frequency band 43.5-45.5 GHz is allocated to the mobile, mobile-satellite, radionavigation and radionavigation-satellite services on a primary basis,

recognizing

the need to protect existing services when considering frequency bands for possible additional allocations to any service,

resolves to invite the ITU Radiocommunication Sector

to conduct, and complete in time for WRC-27:

1 studies considering additional spectrum needs for development of the FSS, taking into account the frequency bands currently allocated to the FSS, the technical conditions of their use and the possibility of optimizing the use of these frequency bands with a view to increasing spectrum efficiency;

2 sharing and compatibility studies with existing services allocated on a primary basis, to determine the suitability of new primary allocations to the FSS in the frequency band 43.5-45.5 GHz,

invites the 2027 World Radiocommunication Conference

to consider the results of studies in *resolves to invite the ITU Radiocommunication Sector* 1 above and take appropriate actions, if necessary,

invites administrations

to participate actively in these studies by submitting contributions to the ITU Radiocommunication Sector.

RESOLUTION 178 (WRC-19)

Studies of technical and operational issues and regulatory provisions for non-geostationary fixed-satellite service satellite system feeder links in the frequency bands 71-76 GHz (space-to-Earth and proposed new Earth-to-space) and 81-86 GHz (Earth-to-space)

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that satellite systems are increasingly being used to deliver broadband services and are part of the solutions to enable broadband access;

b) that next-generation fixed-satellite service (FSS) technologies are required to deliver multi-terabit speeds to support demanding real-time applications, which can be delivered by large-constellation non-geostationary-satellite (non-GSO) FSS systems;

c) that the particular characteristics of such high-capacity feeder links for large-constellation non-GSO FSS systems involve highly directional antennas on both the satellites and the earth stations and, as such, may be conducive to frequency-sharing arrangements including, but not limited to, consideration of reverse-band operation in certain situations, and consideration of whether No. **22.2** can be replaced by another sharing mechanism between geostationary-satellite (GSO) and non-GSO systems in some or all of the frequency bands 71-76 GHz and 81-86 GHz;

d) that GSO networks are operating or planned to operate in these frequency bands and that some administrations are considering deploying high-density fixed-service links in these frequency bands;

e) that studies are required in order to ascertain the feasibility of, and conditions for, non-GSO FSS satellite system feeder links sharing the frequency bands 71-76 GHz (space-to-Earth) and 81-86 GHz (Earth-to-space) with GSO links and with other non-GSO FSS satellite systems;

f) that studies are required to ascertain the feasibility of, and conditions for, a possible new allocation to the FSS (Earth-to-space), for reverse-band feeder links for non-GSO FSS satellite systems in the frequency band 71-76 GHz;

g) that the frequency bands 71-76 GHz and 81-86 GHz are allocated to various services,

considering further

a) that Recommendations ITU-R S.1323, ITU-R S.1325, ITU-R S.1328, ITU-R S.1526 and ITU-R S.1529 provide information on non-GSO and GSO FSS system characteristics, operational requirements and protection criteria that may be used in sharing studies;

b) that Recommendation ITU-R F.2006 provides information on radio-frequency channel and block arrangements for fixed wireless systems operating in the frequency bands 71-76 GHz and 81-86 GHz;

c) that Recommendation ITU-R M.2057 provides information on system characteristics of automotive radars operating in the frequency band 76-81 GHz for intelligent transport system applications;

d) that the ITU Radiocommunication Sector (ITU-R) expert group is currently developing FSS characteristics in the frequency bands 71-76 GHz and 81-86 GHz to provide additional system characteristics of planned high millimetre-wave FSS networks and systems,

noting

a) that filing information for GSO and non-GSO FSS satellite networks in the frequency bands 71-76 GHz (space-to-Earth) and 81-86 GHz (Earth-to-space) has recently been communicated to the Radiocommunication Bureau;

b) that the frequency band 71-76 GHz is also allocated to the fixed and mobile services on a primary basis and is extensively used for applications in the fixed service;

c) that the frequency band 74-76 GHz is also allocated to the broadcasting service and the broadcasting-satellite service (BSS) on a primary basis, as well as the space research service (SRS) in the space-to-Earth direction on a secondary basis;

d) that, in the frequency band 74-76 GHz, the fixed, mobile and broadcasting services shall not cause harmful interference to stations of the FSS in accordance with No. **5.561**;

e) that the frequency band 81-86 GHz is also allocated to the fixed and mobile services and the radio astronomy service (RAS) on a primary basis, as well as the SRS in the space-to-Earth direction on a secondary basis;

f) that Resolution **750 (Rev.WRC-19)** applies in the frequency band 81-86 GHz in accordance with No. **5.338A**;

g) that the frequency band 81-84 GHz is also allocated to the mobile-satellite service (MSS) in the Earth-to-space direction on a primary basis;

h) that the frequency band 81-81.5 GHz is also allocated to the amateur and amateur-satellite services on a secondary basis;

i) that the frequency band 76-81 GHz is also allocated to the radiolocation service on a primary basis,

recognizing

a) that No. **21.16** does not contain power flux-density limits applicable to FSS satellites to protect fixed and mobile services with allocations in the frequency band 71-76 GHz;

b) that the frequency band 86-92 GHz is allocated on a primary basis to the Earth exploration-satellite service (EESS) (passive), the RAS and the SRS (passive), which must be protected, and in accordance with No. **5.340** all emissions are prohibited in the frequency band;

c) that No. **5.149** indicates that radio astronomy observations are carried out in the frequency band 76-86 GHz and that mitigation measures may have to be defined in this regard,

resolves to invite the ITU Radiocommunication Sector

to conduct, and complete in time for WRC-27:

1 studies considering additional spectrum needs for the development of non-GSO FSS satellite systems in the frequency bands 71-76 GHz and 81-86 GHz, the technical conditions for their use, and the possibility of optimizing the use of these frequency bands with a view to increasing spectrum efficiency;

2 studies of technical and operational issues for the operation of feeder links for non-GSO FSS satellite systems in the frequency bands 71-76 GHz (space-to-Earth and the feasibility of a possible new allocation for reverse-band feeder operation in the Earth-to-space direction) and 81-86 GHz (Earth-to-space), as well as consideration of regulatory provisions in some or all of these frequency bands for non-GSO systems coordinating and sharing with both GSO and other non-GSO systems in the FSS, MSS and BSS, and their specific earth stations, taking into account the future growth of these uses and the need to ensure their protection;

3 sharing and compatibility studies between non-GSO FSS satellite system feeder links in the frequency bands 71-76 GHz (space-to-Earth and a possible new allocation for non-GSO FSS in the Earth-to-space direction) and 81-86 GHz (Earth-to-space) and other existing co-primary services, including the fixed and mobile services, in those frequency bands and in adjacent frequency bands, taking into account the need to ensure the protection of these services;

4 studies of possible necessary provisions of the Radio Regulations to ensure protection of the EESS (passive) and SRS (passive) in the frequency band 86-92 GHz from non-GSO FSS transmissions, including study of aggregate FSS interference;

5 studies towards ensuring protection of the RAS operating in the frequency bands 76-86 GHz and 86-92 GHz from non-GSO FSS transmissions, taking into account *recognizing b)* above, including study of aggregate FSS interference effects from networks and systems operating or planned to operate in the frequency bands described in *resolves to invite the ITU Radiocommunication Sector* 2 above,

invites the 2027 World Radiocommunication Conference

to consider the results of the above studies and take appropriate action,

invites administrations

to participate in the studies by submitting contributions to ITU-R.

RESOLUTION 223 (REV.WRC-19)

Additional frequency bands identified for International Mobile Telecommunications

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that International Mobile Telecommunications (IMT), including IMT-2000, IMT-Advanced and IMT-2020, is the ITU vision of global mobile access;

b) that IMT systems provide telecommunication services on a worldwide scale regardless of location, network or terminal used;

c) that IMT provides access to a wide range of telecommunication services supported by fixed telecommunication networks (e.g. public switched telephone network (PSTN)/integrated services digital network (ISDN), high bit rate Internet access), and to other services which are specific to mobile users;

d) that the technical characteristics of IMT are specified in ITU Radiocommunication Sector (ITU-R) and ITU Telecommunication Standardization Sector (ITU-T) Recommendations, including Recommendations ITU-R M.1457 and ITU-R M.2012, which contain the detailed specifications of the terrestrial radio interfaces of IMT;

e) that the evolution of IMT is being studied within ITU-R;

f) that the review of IMT-2000 spectrum requirements at WRC-2000 concentrated on the frequency bands below 3 GHz;

g) that at WARC-92, 230 MHz of spectrum was identified for IMT-2000 in the frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz, including the frequency bands 1 980-2 010 MHz and 2 170-2 200 MHz for the satellite component of IMT-2000, in No. 5.388 and under the provisions of Resolution **212 (Rev.WRC-19)**;

h) that since WARC-92 there has been a tremendous growth in mobile communications including an increasing demand for broadband multimedia capability;

i) that the frequency bands identified for IMT are currently used by mobile systems or applications of other radiocommunication services;

j) that Recommendation ITU-R M.1308 addresses the evolution of existing mobile communication systems to IMT-2000, and that Recommendation ITU-R M.1645 addresses the evolution of the IMT systems and maps out their future development;

k) that harmonized worldwide frequency bands for IMT are desirable in order to achieve global roaming and the benefits of economies of scale;

l) that the frequency bands 1 710-1 885 MHz, 2 500-2 690 MHz and 3 300-3 400 MHz are allocated to a variety of services in accordance with the relevant provisions of the Radio Regulations;

m) that the frequency band 2 300-2 400 MHz is allocated to the mobile service on a co-primary basis in the three ITU Regions;

n) that the frequency band 2 300-2 400 MHz, or portions thereof, is used extensively in a number of administrations by other services including the aeronautical mobile service (AMS) for telemetry in accordance with the relevant provisions in the Radio Regulations;

o) that IMT has already been deployed or is being considered for deployment in some countries in the frequency bands 1 710-1 885 MHz, 2 300-2 400 MHz and 2 500-2 690 MHz and equipment is readily available;

p) that the frequency bands 1 710-1 885 MHz, 2 300-2 400 MHz and 2 500-2 690 MHz, or parts thereof, are identified for use by administrations wishing to implement IMT;

q) that technological advancement and user needs will promote innovation and accelerate the delivery of advanced communication applications to consumers;

r) that changes in technology may lead to the further development of communication applications, including IMT;

s) that timely availability of spectrum is important to support future applications;

t) that IMT systems are envisaged to provide increased peak data rates and capacity that may require a larger bandwidth;

u) that ITU-R studies forecasted that additional spectrum may be required to support the future services of IMT and to accommodate future user requirements and network deployments;

v) that the frequency band 1 427-1 429 MHz is allocated to the mobile, except aeronautical mobile, service in all three Regions on a primary basis;

w) that the frequency band 1 429-1 525 MHz is allocated to the mobile service in Regions 2 and 3 and to the mobile, except aeronautical mobile, service in Region 1 on a primary basis;

x) that the frequency band 1 518-1 559 MHz is allocated in all three Regions to the mobile-satellite service (MSS) on a primary basis[1];

y) that WRC-15 identified the frequency band 1 427-1 518 MHz for use by administrations wishing to implement terrestrial IMT systems;

z) that there is a need to ensure the continued operations of the MSS in the frequency band 1 518-1 525 MHz;

aa) that appropriate technical measures to facilitate adjacent frequency band compatibility between the MSS in the frequency band 1 518-1 525 MHz and IMT in the frequency band 1 492-1 518 MHz need to be studied;

ab) Report ITU-R RA.2332, on compatibility and sharing studies between the radio astronomy service and IMT systems in the frequency bands 608-614 MHz, 1 330-1 400 MHz, 1 400-1 427 MHz, 1 610.6-1 613.8 MHz, 1 660-1 670 MHz, 2 690-2 700 MHz, 4 800-4 990 MHz and 4 990-5 000 MHz;

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[1] See Table **21-4** for applicable pfd limits.

ac) that WRC-15 and this conference identified the frequency band 3 300-3 400 MHz for use by administrations wishing to implement terrestrial IMT systems in Nos. **5.429B**, **5.429D** and **5.429F**;

ad) that the frequency band 3 300-3 400 MHz is allocated worldwide on a primary basis to the radiolocation service;

ae) that a number of administrations use the frequency band 3 300-3 400 MHz, or portions thereof, which is allocated to the fixed and mobile services on a primary basis in No. **5.429**;

af) that the frequency band 4 800-4 990 MHz is allocated worldwide to the mobile and fixed services on a primary basis;

ag) that WRC-15 and this conference identified the frequency band 4 800-4 990 MHz for use by administrations wishing to implement terrestrial IMT systems in countries listed in Nos. **5.441A** and **5.441B**;

ah) that appropriate technical measures may be considered by administrations at a national level to facilitate adjacent frequency band compatibility between radio astronomy receivers in the frequency band 4 990-5 000 MHz and IMT systems in the frequency band 4 800-4 990 MHz,

emphasizing

a) that flexibility must be afforded to administrations:

– to determine, at a national level, how much spectrum to make available for IMT from within the identified frequency bands;

– to develop their own transition plans, if necessary, tailored to meet their specific deployment of existing systems;

– to have the ability for the identified frequency bands to be used by all services having allocations in those frequency bands;

– to determine the timing of availability and use of the frequency bands identified for IMT, in order to meet particular user demand and other national considerations;

b) that the particular needs of developing countries must be met;

c) that Recommendation ITU-R M.819 describes the objectives to be met by IMT-2000 in order to meet the needs of developing countries,

noting

a) Resolutions **224 (Rev.WRC-19)** and **225 (Rev.WRC-12)**, which also relate to IMT;

b) that the sharing implications between services sharing the frequency bands identified for IMT in No. 5.384A, as relevant, will need further study in ITU-R;

c) that studies regarding the availability of the frequency band 2 300-2 400 MHz for IMT are being conducted in many countries, the results of which could have implications for the use of those frequency bands in those countries;

d) that, due to differing requirements, not all administrations may need all of the IMT frequency bands identified at WRC-07, or, due to the usage by and investment in existing services, may not be able to implement IMT in all of those frequency bands;

e) that the spectrum for IMT identified by WRC-07 may not completely satisfy the expected requirements of some administrations;

f) that currently operating mobile communication systems may evolve to IMT in their existing frequency bands;

g) that services such as the fixed service, the mobile service (second-generation systems), the space operation service, the space research service and the AMS are in operation or planned in the frequency band 1 710-1 885 MHz, or portions thereof;

h) that in the frequency band 2 300-2 400 MHz, or portions thereof, there are services such as the fixed, mobile, amateur and radiolocation services which are currently in operation or planned to be in operation in the future;

i) that services such as the broadcasting-satellite service (BSS), the BSS (sound), the MSS (in Region 3) and the fixed service (including multipoint distribution/communication systems) are in operation or planned in the frequency band 2 500-2 690 MHz, or portions thereof;

j) that the identification of several frequency bands for IMT allows administrations to choose the best frequency band or parts thereof for their circumstances;

k) that further study of the technical and operational measures regarding adjacent frequency band compatibility between IMT systems operating below 3 400 MHz and fixed-satellite service earth stations operating above 3 400 MHz may be required;

l) that ITU-R has identified additional work to address further developments in IMT;

m) that the IMT terrestrial radio interfaces as defined in Recommendations ITU-R M.1457 and ITU-R M.2012 are expected to evolve within the framework of ITU-R beyond those initially specified, to provide enhanced services and services beyond those envisaged in the initial implementation;

n) that the identification of a frequency band for IMT does not establish priority in the Radio Regulations and does not preclude the use of the frequency band for any application of the services to which it is allocated;

o) that the provisions of Nos. **5.317A**, **5.384A**, **5.388**, **5.429B**, **5.429D**, **5.429F**, **5.441A** and **5.441B** do not prevent administrations from having the choice to implement other technologies in the frequency bands identified for IMT, based on national requirements,

recognizing

that for some administrations the only way of implementing IMT would be spectrum refarming, requiring significant financial investment,

resolves

1 to invite administrations planning to implement IMT to make available, based on user demand and other national considerations, additional frequency bands or portions of the frequency bands above 1 GHz identified in Nos. **5.341B**, **5.384A**, **5.429B**, **5.429D**, **5.429F**, **5.441A** and **5.441B** for the terrestrial component of IMT; due consideration should be given to the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT, taking into account the services to which the frequency band is currently allocated;

2 to acknowledge that the differences in the texts of Nos. **5.341B**, **5.384A** and **5.388** do not confer differences in regulatory status;

3 that in the frequency bands 4 800-4 825 MHz and 4 835-4 950 MHz, in order to identify potentially affected administrations when applying the procedure for seeking agreement under No. 9.21 by IMT stations in relation to aircraft stations, a coordination distance from an IMT station to the border of another country equal to 300 km (for land path)/450 km (for sea path) applies;

4 that in the frequency band 4 800-4 990 MHz, in order to identify potentially affected administrations when applying the procedure for seeking agreement under No. 9.21 by IMT stations in relation to fixed-service stations or other ground-based stations of the mobile service, a coordination distance from an IMT station to the border of another country equal to 70 km applies;

5 that the power flux-density (pfd) limits in No. **5.441B**, which is subject to review at WRC-23, shall not apply to the following countries: Armenia, Brazil, Cambodia, China, Russian Federation, Kazakhstan, Lao P.D.R., Uzbekistan, South Africa, Viet Nam and Zimbabwe,

invites the ITU Radiocommunication Sector

1 to conduct compatibility studies in order to provide technical measures to ensure coexistence between the MSS in the frequency band 1 518-1 525 MHz and IMT in the frequency band 1 492-1 518 MHz, including guidance on the implementation of frequency arrangements for IMT deployment in the frequency band 1 427-1 518 MHz, taking into account the results of these studies;

2 to study the technical and regulatory conditions for the protection of stations of the AMS and the maritime mobile service (MMS) located in international airspace or waters (i.e. outside national territories) and operated in the frequency band 4 800-4 990 MHz;

3 to continue providing guidance to ensure that IMT can meet the telecommunication needs of developing countries and rural areas;

4 to include the results of the studies mentioned in *invites the ITU Radiocommunication Sector* above in one or more ITU-R Recommendations and Reports, as appropriate,

invites the 2023 World Radiocommunication Conference

to consider, based on the results of the studies referred to in *invites the ITU Radiocommunication Sector* above, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the AMS and MMS located in international airspace and waters from other stations located within national territories and to review the pfd criteria in No. **5.441B**.

RESOLUTION 235 (WRC-15)

Review of the spectrum use of the frequency band 470-960 MHz in Region 1

The World Radiocommunication Conference (Geneva, 2015),

considering

a) that the favourable propagation characteristics in the frequency bands below 1 GHz are beneficial in providing cost-effective solutions for coverage;

b) that there is a need to continually take advantage of technological developments in order to increase the efficient use of the spectrum and facilitate spectrum access;

c) that the frequency band 470-862 MHz is a harmonized band used to provide terrestrial television broadcasting services on a worldwide scale;

d) that, in many countries, there is a sovereign obligation to provide broadcasting services;

e) that terrestrial broadcasting networks have a long life cycle, and a stable regulatory environment is necessary to provide protection of investment and future development;

f) that, in many countries, there is a need for investment in the next decade for the migration of broadcasting into the frequency band below 694 MHz and for the implementation of new-generation broadcasting technologies, in order to take advantage of technological developments to increase the efficient use of the spectrum;

g) that in many developing countries terrestrial broadcasting is the only viable means of delivery of broadcast services;

h) that the technology trend in digital terrestrial television (DTT) is towards high-definition television which requires a higher bit rate than standard-definition television;

i) that it is necessary to adequately protect all primary services in the frequency band 470-694 MHz and in adjacent frequency bands;

j) that International Mobile Telecommunications (IMT) systems, utilizing some parts of the frequency band 694/698-960 MHz, are intended to provide telecommunication services on a worldwide scale, regardless of location, network or terminal used;

k) that, for countries listed in No. **5.296**, an additional allocation to the land-mobile service on a secondary basis is in place, intended for applications ancillary to broadcasting and programme-making;

l) that the frequency band 645-862 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS) in the countries listed in No. **5.312**;

m) that, in some countries, parts of the frequency band are also allocated to the radiolocation service on a secondary basis, limited to the operation of wind profiler radars (No. **5.291A**), and also to the radio astronomy service on a secondary basis (No. **5.306**), and, according to No. **5.149**, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference when making assignments to stations of other services,

recognizing

a) that the GE06 Agreement applies in all Region 1 countries, except Mongolia, and in Iran (Islamic Republic of), in particular for the frequency band 470-862 MHz;

b) that the GE06 Agreement contains provisions for the terrestrial broadcasting service and other primary terrestrial services, a Plan for digital television and a list of stations of other primary terrestrial services;

c) that a digital entry in the GE06 Plan may also be used for transmissions in a service other than the broadcasting service under the conditions set out in § 5.1.3 of the GE06 Agreement and the provisions of No. **4.4** of the Radio Regulations;

d) that information on implementation of the digital dividend and on the transition to digital television and its technological evolution is needed and may not be available before 2019,

noting

the ongoing development of new applications and technologies of both the broadcasting and mobile services,

resolves to invite ITU-R, after the 2019 World Radiocommunication Conference and in time for the 2023 World Radiocommunication Conference

1 to review the spectrum use and study the spectrum needs of existing services within the frequency band 470-960 MHz in Region 1, in particular the spectrum requirements of the broadcasting and mobile, except aeronautical mobile, services, taking into account the relevant ITU Radiocommunication Sector (ITU-R) studies, Recommendations and Reports;

2 to carry out sharing and compatibility studies, as appropriate, in the frequency band 470-694 MHz in Region 1 between the broadcasting and mobile, except aeronautical mobile, services, taking into account relevant ITU-R studies, Recommendations and Reports;

3 to conduct sharing and compatibility studies, as appropriate, in order to provide relevant protection of systems of other existing services,

invites administrations

to participate actively in the studies by submitting contributions to ITU-R,

resolves to invite the 2023 World Radiocommunication Conference

to consider, based on the results of studies above, provided that these studies are completed and approved by ITU-R, possible regulatory actions in the frequency band 470-694 MHz in Region 1, as appropriate,

further invites ITU-R

to ensure intersectoral collaboration with the ITU Telecommunication Development Sector (ITU-D) in the implementation of this Resolution.

RESOLUTION 245 (WRC-19)

Studies on frequency-related matters for the terrestrial component of International Mobile Telecommunications identification in the frequency bands 3 300-3 400 MHz, 3 600-3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that International Mobile Telecommunications (IMT) is intended to provide telecommunication services on a worldwide scale, regardless of location and type of network or terminal;

b) that IMT systems have contributed to global economic and social development;

c) that IMT systems are now being evolved to provide diverse usage scenarios such as enhanced mobile broadband, massive machine-type communications and ultra-reliable and low-latency communications, and applications including fixed broadband;

d) that ultra-low latency and very high bit-rate applications of IMT will require contiguous blocks of spectrum for use by administrations wishing to implement IMT;

e) that, compared with lower and higher frequency bands, the mid-band spectrum can provide better balance for meeting needs for both coverage and capacity;

f) that there is a need to continually take advantage of technological developments in order to increase the efficient use of spectrum and facilitate spectrum access;

g) that the properties of higher frequency bands, such as short wavelength, would better enable the use of advanced antenna systems, including multiple-input and multiple-output (MIMO) and beam-forming techniques, in supporting enhanced broadband;

h) that the ITU Telecommunication Standardization Sector has been working on network standardization for IMT-2020 and beyond;

i) that adequate and timely availability of spectrum and corresponding regulatory provisions are essential to support the future development of IMT;

j) that harmonized worldwide frequency bands and harmonized frequency arrangements for IMT are highly desirable in order to achieve global roaming and the benefits of economies of scale;

k) that identification of frequency bands as in *considering e)* for IMT may change the sharing situation regarding applications of all services to which the frequency band is already allocated, and may require additional regulatory actions;

l) the need to protect existing services and to allow for their continued development when considering frequency bands for possible additional allocations to any service,

noting

a) that Resolution ITU-R 65 addresses the principles for the process of development of IMT for 2020 and beyond;

b) that IMT encompasses IMT-2000, IMT-Advanced and IMT-2020 collectively, as described in Resolution ITU-R 56-2;

c) that Question ITU-R 77-8/5 considers the needs of developing countries in the development and implementation of IMT;

d) that Question ITU-R 229/5 seeks to address the further development of IMT;

e) that Question ITU-R 262/5 addresses the study of usage of IMT systems for specific applications;

f) Recommendation ITU-R M.2083, on the framework and objectives of the future development of IMT for 2020 and beyond;

g) Recommendation ITU-R M.2101, on modelling and simulation of IMT networks and systems for use in sharing and compatibility studies;

h) Recommendation ITU-R P.2108, on prediction of clutter loss;

i) that Report ITU-R M.2320 addresses future technology trends of terrestrial IMT systems;

j) that Report ITU-R M.2370 analyses trends impacting future IMT traffic growth beyond the year 2020 and estimates global traffic demand for the period 2020 to 2030;

k) Report ITU-R M.2376, on technical feasibility of IMT in the frequency bands above 6 GHz;

l) Report ITU-R M.2410, on minimum requirements related to technical performance for IMT-2020 radio interface(s);

m) Report ITU-R M.2481, on in-band and adjacent band coexistence and compatibility studies between IMT systems in the frequency band 3 300-3 400 MHz and radiolocation systems in the frequency band 3 100-3 400 MHz,

recognizing

a) that there is a lead time between the allocation of frequency bands by world radiocommunication conferences and the deployment of systems in those bands, and that timely availability of wide and contiguous blocks of spectrum is therefore important to support the development of IMT;

b) that in order to ensure the future development of IMT it is important to ensure the timely identification of additional spectrum;

c) that any identification of frequency bands for IMT should take into account the use of the frequency bands by other services and the evolving needs of these services,

resolves to invite the ITU Radiocommunication Sector

1 to conduct and complete in time for WRC-23 the appropriate studies of technical, operational and regulatory issues pertaining to the possible use of the terrestrial component of IMT in the frequency bands listed in *resolves to invite the ITU Radiocommunication Sector* 2, taking into account:

– evolving needs to meet emerging demand for IMT;

– technical and operational characteristics of terrestrial IMT systems that would operate in these specific frequency bands, including the evolution of IMT through advances in technology and spectrally efficient techniques;

– the deployment scenarios envisaged for IMT systems and the related requirements of balanced coverage and capacity;

– the needs of developing countries;

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

2 to conduct and complete in time for WRC-23 the sharing and compatibility studies[1], with a view to ensuring the protection of services to which the frequency band is allocated on a primary basis, without imposing additional regulatory or technical constraints on those services, and also, as appropriate, on services in adjacent bands, for the frequency bands:

– 3 600-3 800 MHz and 3 300-3 400 MHz (Region 2);

– 3 300-3 400 MHz (amend footnote in Region 1);

– 7 025-7 125 MHz (globally);

– 6 425-7 025 MHz (Region 1);

– 10.0-10.5 GHz (Region 2),

resolves

1 to invite the first session of the Conference Preparatory Meeting for WRC-23 to define the date by which technical and operational characteristics needed for sharing and compatibility studies are to be available to ensure that studies referred to in *resolves to invite the ITU Radiocommunication Sector* can be completed in time for consideration at WRC-23;

2 to invite WRC-23 to consider, based on the results of the above studies, additional spectrum allocations to the mobile service on a primary basis and to consider identification of frequency bands for the terrestrial component of IMT, the frequency bands to be considered being limited to part or all of the frequency bands listed in *resolves to invite the ITU Radiocommunication Sector* 2,

invites administrations

to participate actively in these studies by submitting contributions to the ITU Radiocommunication Sector.

[1] Including studies with respect to services in adjacent bands, as appropriate.

RESOLUTION 246 (WRC-19)

Studies to consider possible allocation of the frequency band 3 600-3 800 MHz to the mobile, except aeronautical mobile, service on a primary basis within Region 1

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the frequency band 3 600-3 800 MHz is allocated to the fixed and fixed-satellite services on a primary basis in all three Regions and is also allocated to the mobile, except aeronautical mobile, service on a primary basis within Regions 2 and 3;

b) that the frequency band 3 600-3 800 MHz is allocated to the mobile service on a secondary basis within Region 1;

c) that terrestrial systems of the mobile service are intended to provide telecommunication services on a worldwide scale, regardless of location;

d) that some administrations in Region 1 are currently using the frequency band 3 600-3 800 MHz, or part of that frequency band, for the mobile service (for example International Mobile Telecommunications (IMT) implementation);

e) the need to protect existing services when considering possible additional allocation to any service in any frequency band;

f) that the systems operating in the new allocation should not impose constraints on the existing systems of primary services, including in adjacent frequency bands,

recognizing

a) that there is a need in many countries to identify additional harmonized spectrum resources for cost-effective implementation of mobile systems;

b) that the ITU Radiocommunication Sector (ITU-R) performed studies in the frequency band 3 400-4 200 MHz between the fixed-satellite service (FSS) and IMT during previous study cycles (for example Reports ITU-R S.2368 and ITU-R M.2109);

c) that for African countries, especially those in tropical areas, the operations of FSS systems are more reliable for use in at C-band frequencies (3 400-4 200 MHz), rather than in higher frequency bands,

resolves to invite the ITU Radiocommunication Sector

to conduct sharing and compatibility studies in time for WRC-23 between the mobile service and other services allocated on a primary basis within the frequency band 3 600-3 800 MHz and adjacent frequency bands in Region 1, as appropriate, to ensure protection of those services to which the frequency band is allocated on a primary basis and not impose undue constraints on the existing services and their future development,

invites the 2023 World Radiocommunication Conference

based on the results of studies in *resolves to invite the ITU Radiocommunication Sector*, to consider possible upgrade of the allocation of the frequency band 3 600-3 800 MHz to the mobile, except aeronautical mobile, service on a primary basis within Region 1, and to take appropriate regulatory actions,

invites administrations

to participate in these studies in the process of preparation for WRC-23.

RESOLUTION 247 (WRC-19)

Facilitating mobile connectivity in certain frequency bands below 2.7 GHz using high-altitude platform stations as International Mobile Telecommunications base stations

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that there is growing demand for access to mobile broadband, requiring more flexibility in the approaches to expand the capacity and coverage provided by International Mobile Telecommunications (IMT) systems;

b) that high-altitude platform stations as IMT base stations (HIBS) would be used as part of terrestrial IMT networks, and may use the same frequency bands as ground-based IMT base stations in order to provide mobile-broadband connectivity to underserved communities, and in rural and remote areas;

c) that IMT systems have evolved significantly in terms of spectrum identification, network deployment and radio access technology, with the standardization of IMT-Advanced and IMT-2020;

d) that studies of new IMT network topologies may provide increased spectrum efficiency for the frequency bands already identified for IMT;

e) that HIBS may be used as a part of terrestrial IMT networks to provide mobile connectivity to underserved communities and in rural and remote areas, with the ability to utilize a large footprint at low latency;

f) that recent technological advances in battery and solar-panel technologies provide further support for the deployment of HIBS;

g) that the user equipment to be served, whether by HIBS or ground-based IMT base stations, is the same, and currently supports a variety of the frequency bands identified for IMT;

h) that mobile connectivity is becoming widespread, connecting not only people but also objects (e.g. IoT: Internet of Things, IoE: Internet of Everything), based on IMT technologies (e.g. eMTC: enhanced machine-type communication, NB-IoT: narrowband IoT) which are expected to be used widely, including in unpopulated areas;

i) that the use of HIBS within the terrestrial component of IMT should not have any priority, and shall not cause any undue constraints which result in regulatory changes to the existing IMT identifications in the Radio Regulations;

j) that studies must be performed to demonstrate that sharing with existing services in the frequency band, including other IMT uses, is feasible, and that those existing services are protected with no new regulatory constraints on those existing uses and planned development;

k) that any potential new regulatory procedural considerations resulting from potential HIBS identifications should not apply to existing IMT identifications in the Radio Regulations;

l) that studies should be limited to sharing and compatibility between HIBS and other existing services and applications;

m) that the frequency bands identified for IMT below 2.7 GHz are used extensively to provide mobile-broadband services using ground-based IMT systems,

noting

that Recommendations ITU-R M.1456 and ITU-R M.1641 provide technical characteristics and operational conditions, as well as a methodology for the studies between HIBS and ground-based IMT systems in certain frequency bands around 1.9/2.1 GHz,

recognizing

a) that high-altitude platform station is defined in No. **1.66A** as a station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth;

b) that the frequency bands 1 885-1 980 MHz, 2 010-2 025 MHz and 2 110-2 170 MHz in Regions 1 and 3 and the frequency bands 1 885-1 980 MHz and 2 110-2 160 MHz in Region 2 are included in No. **5.388A** for the use of HIBS, in accordance with the provisions of Resolution **221 (Rev.WRC-07)**;

c) that Nos. **5.388A** and **5.388B** and Resolution **221 (Rev.WRC-07)** stipulate technical conditions for high-altitude IMT necessary for the protection of ground-based IMT stations in neighbouring countries and other services, based on the sharing and compatibility studies with IMT-2000;

d) that some frequency bands below 2.7 GHz are globally or regionally identified for IMT in accordance with Nos. **5.286AA**, **5.317A**, **5.341A**, **5.341B, 5.341C, 5.346**, **5.346A**, **5.384A** and **5.388**;

e) that the ITU Radiocommunication Sector (ITU-R) is conducting co-channel sharing analysis involving IMT-Advanced systems using HIBS;

f) that some geostationary-satellite mobile-satellite service (MSS) networks in Region 3 have reported harmful interference affecting their uplinks in the frequency band 2 655-2 690 MHz from terrestrial IMT stations operating in some countries in Region 3 and Region 1, and ITU-R is conducting sharing and coexistence studies between the MSS and terrestrial IMT systems in the frequency band 2 655-2 690 MHz;

g) that the frequency bands 2 520-2 670 MHz and 2 700-2 900 MHz are allocated on a primary basis to the broadcasting-satellite service and the aeronautical radionavigation service, respectively,

resolves to invite the ITU Radiocommunication Sector

1 to study spectrum needs, as appropriate, for HIBS to provide mobile connectivity in the mobile service, taking into account:

– the existing identification in *recognizing b)*;

– the usage and deployment scenario envisioned for HIBS as complementary for terrestrial IMT networks;

– the technical and operational characteristics and requirements of HIBS;

2 to conduct and complete in time for WRC-23, taking into account the results of studies already performed and those in progress within ITU-R, sharing and compatibility studies to ensure the protection of services, without imposing any additional technical or regulatory constraints in their deployment, to which the frequency band is allocated on a primary basis, including other IMT uses, existing systems and the planned development of primary allocated services, and adjacent services, as appropriate, for certain frequency bands below 2.7 GHz, or portions thereof, globally or regionally harmonized for IMT, i.e.:

– 694-960 MHz;

– 1 710-1 885 MHz (1 710-1 815 MHz to be used for uplink only in Region 3);

– 2 500-2 690 MHz (2 500-2 535 MHz to be used for uplink only in Region 3, except 2 655-2 690 MHz in Region 3);

3 to study appropriate modifications to the existing footnote and associated resolution in the identification referred to in *recognizing b)* in order to facilitate the use of HIBS with the latest radio interface technologies of IMT;

4 to study the definition of HIBS, including possible modifications to the provisions of the Radio Regulations, as appropriate;

5 to develop ITU-R Recommendations and Reports, as appropriate, taking into account *resolves to invite the ITU Radiocommunication Sector* 1, 2, 3 and 4 above,

invites the 2023 World Radiocommunication Conference

to consider, based on the results of the above studies, the use of HIBS in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level, and take necessary regulatory actions, as appropriate, taking into account that changes to the footnotes referred to in *recognizing d)* are outside the scope and there should be no additional regulatory or technical constraints imposed on the deployment of ground-based IMT systems in the frequency bands referred to in those footnotes,

invites administrations

to participate actively in these studies by submitting contributions to ITU-R.

RESOLUTION 248 (WRC-19)

Studies relating to spectrum needs and potential new allocations to the mobile-satellite service in the frequency bands 1 695-1 710 MHz, 2 010-2 025 MHz, 3 300-3 315 MHz and 3 385-3 400 MHz for future development of narrowband mobile-satellite systems

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that a preliminary assessment of the spectrum requirements would suggest that a pairing of no more than 5 MHz in the uplink and 5 MHz in the downlink may suffice for the applications of low data-rate systems for the collection of data from, and management of, terrestrial devices in the mobile-satellite service (MSS);

b) that the frequency bands under consideration, namely 1 695-1 710 MHz, 2 010-2 025 MHz, 3 300-3 315 MHz and 3 385-3 400 MHz, are allocated on a primary or secondary basis to the mobile service, fixed service, mobile-satellite service (MSS), amateur service, radiolocation service and meteorological services, among others;

c) that previous studies only addressed spectrum requirements for the satellite component of International Mobile Telecommunications (IMT) – IMT-2000 and systems beyond IMT-2000 (Report ITU-R M.2077), and spectrum requirements for new broadband MSS applications in the 4-16 GHz frequency range (Reports ITU-R M.2218 and ITU-R M.2221);

d) that Report ITU-R M.2218 suggests that the operational characteristics of incumbent MSS systems may constrain and effectively hamper the sharing of existing MSS spectrum, resulting in a requirement for additional spectrum for new applications;

e) that Report ITU-R SA.2312 suggests that MSS frequency bands already allocated above 5 GHz are not suited to the inherent size, weight and power restrictions of small satellites (usually having a mass of less than 100 kg);

f) that earth and space stations used for the applications of the systems referred to in *considering a)* may include a combination of low power and intermittent transmissions to facilitate spectrum sharing and spectrum requirements,

noting

a) the existing MSS allocation and current use of the frequency band 2 010-2 025 MHz, in particular in Region 2;

b) that the number of mobile-satellite systems using small satellites for the systems described in *considering a)* is growing and the spectrum demand for suitable MSS allocations is increasing;

c) the examples, technical characteristics and benefits of such satellites given in Report ITU-R SA.2312;

d) the contribution of the applications described in *considering a)*, delivering actionable information, to the promotion of human welfare;

e) the insufficient spectrum opportunities for new applications described in *considering a)* to operate in MSS frequency bands below 5 GHz;

f) that Recommendation ITU-R SA.1158-3 summarized that narrowband short-duration types of data transmissions in the MSS (Earth-to-space) may feasibly share the frequency band 1 670-1 710 MHz with the meteorological-satellite service (space-to-Earth),

recognizing

a) that the existing primary allocated services in the frequency bands considered and adjacent frequency bands shall be protected;

b) the need for regulatory certainty regarding the available spectrum for both satellite and earth station design and planning purposes;

c) that the studies envisaged under *resolves to invite the ITU Radiocommunication Sector* in this Resolution are to be limited to those systems with space stations that have a maximum equivalent isotropically radiated power (e.i.r.p.) of 27 dBW or less, with a beamwidth of no more than 120 degrees, and earth stations that individually communicate no more than once every 15 minutes, for no more than 4 seconds at a time, with a maximum e.i.r.p. of 7 dBW;

d) that some of the frequency bands listed in *resolves to invite the ITU Radiocommunication Sector* 2 are identified for IMT in accordance with No. **5.429D**;

e) that the introduction of the applications of the possible new MSS allocation should not impose constraints on other existing allocated primary services in the frequency bands under consideration and adjacent frequency bands operating in accordance with the Radio Regulations,

resolves to invite the ITU Radiocommunication Sector

1 to conduct studies on spectrum and operational requirements as well as system characteristics of low data-rate systems for the collection of data from, and management of, terrestrial devices in the MSS as described in *considering a)* and limited to the basic characteristics in *recognizing c)*;

2 to conduct sharing and compatibility studies with existing primary services to determine the suitability of new allocations to the MSS, with a view to protecting the primary services, in the following frequency bands and adjacent frequency bands:

- 1 695-1 710 MHz in Region 2,
- 2 010-2 025 MHz in Region 1,
- 3 300-3 315 MHz and 3 385-3 400 MHz in Region 2;

3 to consider possible new primary or secondary allocations, with the necessary technical limitations, taking into account the characteristics described in *recognizing c),* to the MSS for non-geostationary satellites operating low data-rate systems for the collection of data from, and management of, terrestrial devices, based on the results of sharing and compatibility studies, while ensuring the protection of existing primary services in those frequency bands and adjacent frequency bands, without causing undue constraints on their further development,

invites the 2023 World Radiocommunication Conference

to determine, on the basis of the studies conducted under *resolves to invite the ITU Radiocommunication Sector* above, appropriate regulatory actions,

invites administrations

to participate in the studies by submitting contributions to the ITU Radiocommunication Sector.

RESOLUTION 249 (WRC-19)

Study of technical and operational issues and regulatory provisions for space-to-space transmissions in the Earth-to-space direction in the frequency bands [1 610-1 645.5 and 1 646.5-1 660.5 MHz] and the space-to-Earth direction in the frequency bands [1 525-1 544 MHz], [1 545-1 559 MHz], [1 613.8-1 626.5 MHz] and [2 483.5-2 500 MHz] among non-geostationary and geostationary satellites operating in the mobile-satellite service*

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the definition of mobile-satellite service (MSS) in No. **1.25** includes communication between space stations;

b) that the definition of inter-satellite service (ISS) in No. **1.22** includes only links between space stations, and that the term *inter-satellite link* in this resolution is taken to mean a radiocommunication service link between artificial satellites;

c) that many non-geostationary-satellite orbit (non-GSO) satellites operate with limited and non-real-time connectivity to earth stations;

d) that space-to-space communication between such non-GSO satellites and geostationary-satellite orbit (GSO) MSS satellites would enhance the security and efficiency of operations;

e) that MSS satellites operating in the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660.5 MHz and 2 483.5-2 500 MHz can support these types of operation;

f) that using the frequency bands 1 610-1 645.5 MHz and 1 646.5-1 660.5 MHz allocated to the MSS (Earth-to-space) for transmissions in the Earth-to-space direction from non-GSO MSS space stations towards MSS space stations operating at higher orbital altitudes, including GSO, may increase spectral efficiency in these frequency bands;

g) that using the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 613.8-1 626.5 MHz and 2 483.5-2 500 MHz allocated to the MSS (space-to-Earth) for transmissions in the space-to-Earth direction from MSS space stations operating at higher orbital altitudes, including GSO, towards non-GSO MSS satellites, may increase spectral efficiency in these frequency bands;

h) that all MSS allocations in the above frequency bands include a space-to-Earth or Earth-to-space direction indicator, but do not include a space-to-space direction indicator;

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* The appearance of square brackets around certain frequency bands in this Resolution is understood to mean that WRC-23 will consider and review the inclusion of these frequency bands with square brackets and decide, as appropriate.

i) that the ITU Radiocommunication Sector (ITU-R) has begun preliminary studies on the technical and operational issues associated with the operation of space-to-space links between non-GSO MSS satellites and GSO MSS satellites in the above frequency bands, but no studies have been conducted on the technical and operational issues associated with the operation of space-to-space links between non-GSO MSS satellites and non-GSO MSS satellites in the above frequency bands;

j) that it is technically feasible for a lower orbital altitude non-GSO space station to transmit data to and receive data from a higher orbital altitude non-GSO or GSO space station when passing within the satellite antenna coverage beam that is directed towards the Earth;

k) that several satellite systems have been relying on satellite-to-satellite communication in existing satellite frequency bands under No. **4.4**, and such reliance on No. **4.4** does not provide a sound basis for continued development of such systems nor the confidence in commercial viability and availability of the service to the end users;

l) that there is growing interest for utilizing space-to-space satellite links for a variety of applications;

m) that a precedent for space-to-space links sharing with Earth-to-space and space-to-Earth exists for the space operation, Earth exploration-satellite and space research services in the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz through the inclusion of a space-to-space allocation,

recognizing

a) that it is necessary to study the impact on other services, as well as Earth-to-space and space-to-Earth operation within the MSS, of the operation of inter-satellite links in the above frequency bands, taking into account applicable footnotes to the Table of Frequency Allocations, to ensure compatibility with all primary allocated services in these frequency bands and the adjacent frequency bands and avoid harmful interference;

b) that there should be no additional regulatory or technical constraints imposed on primary services to which the frequency band and adjacent frequency bands are currently allocated;

c) that it is necessary to study whether space-to-Earth direction transmissions from space stations at higher orbital altitudes, including GSO, can be successfully received by lower orbital altitude non-GSO satellites, without imposing any additional constraints on all allocated services in these frequency bands;

d) that the sharing scenarios may vary widely because of the wide variety of orbital characteristics of the non-GSO MSS space stations;

e) that out-of-band emissions, signals due to antenna pattern sidelobes, reflections from receiving space stations and in-band unintentional radiation due to Doppler shifts may impact services operating in the same and adjacent or nearby frequency bands;

f) that currently the only option for MSS space stations in the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646-1 660.5 MHz and 2 483.5-2 500 MHz needing to communicate with other orbital space stations is to operate under No. **4.4**, without recognition and on a non-harmful interference/non-protected basis in frequency bands allocated to another space service,

recognizing further

a) that the use of frequency bands by the MSS in the frequency range 1-3 GHz is subject to existing Resolutions, coordination requirements and country footnotes taking into account, in particular, the protection of safety services and aeronautical mobile-satellite (R) services, and of the Global Maritime Distress and Safety System;

b) that the fixed and mobile services are allocated on a primary basis in the frequency band 2 483.5-2 500 MHz on a global basis and that the fixed service is also allocated on a primary basis in the frequency band 1 525-1 530 MHz in Regions 1 and 3;

c) that the radionavigation-satellite service is allocated on a primary basis in the frequency band 1 559-1 610 MHz for both space-to-Earth and space-to-space use,

noting

a) that section 3.1.3.2 of the Director's Report to this conference highlights that the Radiocommunication Bureau has received an increased number of Advance Publication Information (API) submissions for non-GSO networks in frequency bands which are not allocated by Article **5** for the type of service foreseen, including satellite network filings for inter-satellite applications in frequency bands allocated only in the Earth-to-space or space-to-Earth directions;

b) that the Director's Report concludes that, in view of recent technical developments and the increasing number of submissions of inter-satellite links in frequency bands not allocated to the ISS or to a space service in the space-to-space direction, this conference may wish to consider means to give recognition to these uses based on the conditions derived from studies by ITU-R Working Parties 4A and 4C in order to avoid interfering with existing systems operating in the same frequency bands,

resolves to invite the ITU Radiocommunication Sector

1 to study the technical and operational characteristics of different types of non-GSO MSS space stations that operate or plan to operate space-to-space links with GSO MSS networks in the following frequency bands:

a) Earth-to-space direction in the frequency bands [1 626.5-1 645 5 MHz and 1 646.5-1 660.5 MHz]; and

b) space-to-Earth direction in the frequency bands [1 525-1 544 MHz and 1 545-1 559 MHz];

2 to study the technical and operational characteristics of different types of non-GSO MSS space stations that operate or plan to operate space-to-space links with non-GSO and GSO MSS networks in the following frequency bands:

a) Earth-to-space direction in the frequency band [1 610-1 626.5 MHz]; and

b) space-to-Earth direction in the frequency bands [1 613.8-1 626.5 MHz and 2 483.5-2 500 MHz];

3 to study sharing and compatibility between space-to-space links in the cases described in *resolves to invite the ITU Radiocommunication Sector* 1 and 2 and

– current and planned stations of the MSS;

– other existing services allocated in the same frequency bands; and

– other existing services allocated in adjacent frequency bands,

in order to ensure protection of, and not impose undue constraints on, other MSS operations and other services allocated in those frequency bands and in adjacent frequency bands, taking into account *recognizing further a)* to *c)*;

4 to develop technical conditions and regulatory provisions for the operation of space-to-space links in these frequency bands, including new or revised MSS allocations or the addition of ISS allocations, on a secondary basis, while ensuring the protection of, and without imposing additional constraints on, other MSS operations or services allocated in those and adjacent frequency bands, taking into account the results of the studies called for in *resolves to invite the ITU Radiocommunication Sector* 1, 2, and 3 above;

5 to complete these studies by WRC-27,

invites administrations

to participate in the studies by submitting contributions to ITU-R,

invites the 2027 World Radiocommunication Conference

to consider the results of the above studies and take necessary regulatory actions, as appropriate.

RESOLUTION 250 (WRC-19)

Studies on possible allocations to the land mobile service (excluding International Mobile Telecommunications) in the frequency band 1 300-1 350 MHz for use by administrations for the future development of terrestrial mobile-service applications

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that mobile connectivity contributes to global economic and social development;

b) that demand has been increasing steadily for mobile communication services throughout the world;

c) that mobile services play a large and increasing role in connecting users to the Internet;

d) that technological advancement and user needs will promote innovation and accelerate the further development of communication applications;

e) that timely availability of spectrum is important to support future applications;

f) that all studies leading up to WRC-15 between radars and International Mobile Telecommunications (IMT) in the frequency range 1 300-1 350 MHz concluded, based on the parameters provided at that time, that within the same geographical area co-frequency operation of mobile-broadband systems and radar was not feasible;

g) that there is widespread usage of this frequency range in some countries for radar;

h) that WRC-15 noted that in countries where the frequency band is not fully used by these systems, studies were undertaken in the ITU Radiocommunication Sector that showed sharing may be feasible in those countries, subject to various mitigation and coordination measures, however no conclusions were drawn as to their applicability, complexity, practicability or achievability;

i) that some administrations are considering the feasibility of spectrum refarming/relocating some services operating in portions of the frequency band 1 300-1 350 MHz for the land mobile service (LMS), which requires a significant investment;

j) that advanced spectrum sharing techniques are under development that could facilitate additional utilization of spectrum by a number of different services in operation;

k) the need to protect existing services when considering frequency bands for possible additional allocations to any service,

recognizing

a) that the frequency band 1 300-1 350 MHz is allocated to the radiolocation service, the aeronautical radionavigation service and the radionavigation-satellite service (RNSS) on a primary basis;

b) that the RNSS (space-to-Earth) (space-to-space) is allocated, among others, on a primary basis in the adjacent frequency band 1 240-1 300 MHz;

c) that No. **5.149** calls for administrations to take all practicable steps to protect the radio astronomy service from harmful interference in the frequency band 1 330-1 400 MHz, which includes spectral lines of importance for current astronomical investigations,

resolves to invite the ITU Radiocommunication Sector

1 to develop technical and operational characteristics of LMS systems in the frequency band 1 300-1 350 MHz;

2 to conduct sharing and compatibility studies to ensure protection of those services to which the frequency band is allocated on a primary basis, and adjacent frequency bands as appropriate, taking into account *considering f),* for the frequency band 1 300-1 350 MHz;

3 to complete these studies by WRC-27,

invites the 2027 World Radiocommunication Conference

to consider, on the basis of the studies conducted under *resolves to invite the ITU Radiocommunication Sector* above, possible allocations to the LMS.

RESOLUTION 251 (WRC-19)

Removal of the limitation regarding aeronautical mobile in the frequency range 694-960 MHz for the use of International Mobile Telecommunications user equipment by non-safety applications

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that there is a need for greater connectivity of aeronautical vehicles to address existing demand and future requirements from the aeronautical community;

b) that current and future International Mobile Telecommunications (IMT) networks can provide connectivity services to helicopters, small aircraft and unmanned aircraft systems (UAS);

c) that current and future IMT networks may provide communication functions for the beyond visual line-of-sight operation of UAS;

d) that future IMT networks may support direct air-ground connectivity services to commercial airplanes with specific equipment on board airplanes;

e) that the IMT capacities identified in the *considering* paragraphs above have been demonstrated to be feasible by several studies and are currently being developed by standards development organizations,

noting

a) that ITU Radiocommunication Sector sharing and compatibility studies supporting the identification of specific frequency bands for IMT did not consider the use cases described in *considering b)* to *e)*;

b) that the frequency band 694-960 MHz is allocated on a primary basis to the mobile, except aeronautical mobile, service in Region 1;

c) that the frequency bands 890-902 MHz and 928-942 MHz are allocated on a primary basis to the mobile, except aeronautical mobile, service in Region 2 and that the frequency band 902-928 MHz is allocated on a secondary basis to the mobile, except aeronautical mobile, service in Region 2;

d) that Nos. **5.312** and **5.323** allocate the frequency band 645-960 MHz or parts thereof to the aeronautical radionavigation service on a primary basis in several countries of Region 1;

e) that the frequency band 694-960 MHz is allocated on a primary basis to the broadcasting service in Region 1;

f) that Resolution **224 (Rev.WRC-19)** addresses frequency bands for the terrestrial component of IMT below 1 GHz;

g) that Resolution **749 (Rev.WRC-19)** addresses the use of the frequency band 790-862 MHz in countries of Region 1 and the Islamic Republic of Iran by mobile applications and by other services;

h) that Resolution **760 (Rev.WRC-19)** addresses provisions relating to the use of the frequency band 694-790 MHz in Region 1 by the mobile, except aeronautical mobile, service and by other services,

recognizing

that the removal of the limitation regarding aeronautical mobile in the proposed frequency bands would enable the unified use of the IMT identifications by aeronautical user equipment throughout the Regions,

resolves to invite the ITU Radiocommunication Sector

1 to assess relevant aeronautical mobile service scenarios for air-ground and ground-air connectivity for airborne user equipment in IMT networks to be addressed in compatibility and sharing studies;

2 to identify relevant technical parameters associated with the aeronautical mobile systems;

3 to conduct sharing and compatibility studies with existing services, including in adjacent frequency bands;

4 to determine the possibility of removing the aeronautical mobile service exception or other suitable regulatory measures in the frequency ranges 694-960 MHz in Region 1 and 890-942 MHz in Region 2, based on the results of studies,

invites the 2027 World Radiocommunication Conference

to consider the results of the above studies and take appropriate actions.

RESOLUTION 361 (REV.WRC-19)

Consideration of possible regulatory actions to support modernization of the Global Maritime Distress and Safety System and the implementation of e-navigation

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that there is a continuing need in the Global Maritime Distress and Safety System (GMDSS), on a global basis, for improved communications to enhance maritime capabilities;

b) that the International Maritime Organization (IMO) is considering GMDSS modernization;

c) that advanced maritime MF/HF/VHF data systems and satellite communication systems may be used to deliver maritime safety information (MSI) and other GMDSS communications;

d) that IMO is considering additional global and regional GMDSS satellite service providers;

e) that this conference has commenced regulatory actions in regard to modernization of the GMDSS;

f) that IMO is in the process of implementing e-navigation, defined as the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth-to-berth navigation and related services for safety and security at sea and protection of the marine environment;

g) that GMDSS may be influenced by the development of e-navigation in the future,

noting

a) that WRC-12 reviewed Appendix **17** and Appendix **18** to improve efficiency and introduce frequency bands for new digital technology;

b) that WRC-12 reviewed the regulatory provisions and spectrum allocations for use by maritime safety systems for ships and ports;

c) that IMO may evaluate new applications to recognize satellite systems as new GMDSS satellite providers during the WRC-23 study cycle, and that this may also need to be addressed, as appropriate,

noting further

that WRC-12, WRC-15 and this conference have reviewed Appendix **18** to improve efficiency and introduce frequency bands for new digital technology for data communications,

recognizing

a) that advanced maritime communication systems may support GMDSS modernization and the implementation of e-navigation;

b) that IMO efforts to modernize the GMDSS and implement e-navigation may require a review of the Radio Regulations to accommodate advanced maritime communication systems;

c) that, due to the importance of these radio links in ensuring the safe operation of shipping and commerce and safety at sea, they must be resilient to interference;

d) that IMO is evaluating an application to recognize the existing geostationary-satellite system operating on 1 610-1 626.5 MHz (Earth-to-space) and 2 483.5-2 500 MHz (space-to-Earth) as a new GMDSS satellite provider,

resolves to invite the 2023 World Radiocommunication Conference

1 to consider possible regulatory actions, based on ITU Radiocommunication Sector (ITU-R) studies, taking into consideration the activities of IMO, as well as information and requirements provided by IMO, to support GMDSS modernization;

2 to consider possible regulatory actions, including spectrum allocations based on ITU-R studies, for the maritime mobile service, supporting e-navigation;

3 to consider regulatory provisions, if any, based on the results of ITU-R studies referred to in *invites the ITU Radiocommunication Sector* below, to support the introduction of additional satellite systems into the GMDSS,

invites the ITU Radiocommunication Sector

to conduct studies, taking into consideration the activities of IMO and other relevant international organizations, in order to determine spectrum needs and regulatory actions to support GMDSS modernization and the implementation of e-navigation, including the introduction of additional satellite systems into the GMDSS,

instructs the Secretary-General

to bring this Resolution to the attention of IMO and other international and regional organizations concerned.

RESOLUTION 363 (WRC-19)

Considerations to improve utilization of the VHF maritime frequencies in Appendix 18

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that Appendix **18** identifies frequencies to be used for distress and safety communications and other maritime communications on an international basis;

b) that congestion on Appendix **18** frequencies requires consideration of efficient new technologies;

c) that the ITU Radiocommunication Sector (ITU-R) is conducting ongoing studies on improving efficiency in the use of Appendix **18**;

d) that the use of digital technologies will make it possible to respond to the emerging demand for new uses and ease congestion;

e) that use of existing maritime mobile service (MMS) allocations, where practicable, for ship and port security and enhanced maritime safety would be preferable, particularly where international interoperability is required;

f) that changes made in Appendix **18** should not prejudice the future use of these frequencies or the capabilities of systems or new applications required for use by the MMS;

g) that the International Maritime Organization (IMO) has initiated a regulatory scoping exercise for the use of maritime autonomous surface ships (MASS);

h) that the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) is developing ranging mode (R-Mode), which is a radionavigation system that is intended to provide a contingency system in case of temporary global navigation satellite system (GNSS) disruption, to support e-navigation,

recognizing

a) that it is desirable to enhance maritime safety and ship and port security via spectrum-dependent systems;

b) that ITU and relevant international organizations have initiated related studies on the use of digital technologies for maritime safety and ship and port security;

c) that studies will be required to provide a basis for considering possible regulatory provisions to improve maritime safety and ship and port security, which may need access to spectrum for experimental use;

d) that, in order to provide worldwide interoperability of equipment on ships, there should be harmonized technologies, or interoperable technologies, implemented under Appendix **18**;

e) that administrations' and some relevant international organizations' efforts to continue the development of R-Mode to support the implementation of e-navigation may require a review of the Radio Regulations,

noting

a) that WRC-12, WRC-15 and this conference have reviewed Appendix **18** to improve use and efficiency for data communication using digital systems;

b) that maritime on-board communication systems have implemented digital technologies for voice communication as described in Recommendation ITU-R M.1174 to improve efficient use of the frequency band 450-470 MHz;

c) that digital systems have been implemented in the land mobile service,

noting further

that WRC-12, WRC-15 and this conference have reviewed Appendix **18** to improve efficiency and introduce frequency bands for new digital technology for data communication, e.g. for the introduction of the VHF data exchange system (VDES),

resolves to invite the 2027 World Radiocommunication Conference

1 to consider possible changes to Appendix **18** in order to enable use in the MMS for future implementation of new technologies, for improving efficient use of the maritime frequency bands;

2 to consider possible changes to the Radio Regulations for implementation of R-Mode as a new maritime radionavigation service,

invites relevant international organizations

to participate actively in the studies by providing requirements and information that should be taken into account in ITU-R studies,

invites the ITU Radiocommunication Sector

to conduct studies to determine the necessary regulatory provisions and spectrum needs according to *resolves to invite the 2027 World Radiocommunication Conference*,

instructs the Secretary-General

to bring this Resolution to the attention of IMO and other international and regional organizations concerned.

RESOLUTION 428 (WRC-19)

Studies on a possible new allocation to the aeronautical mobile-satellite (R) service within the frequency band 117.975-137 MHz in order to support aeronautical VHF communications in the Earth-to-space and space-to-Earth directions

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the optimization of air traffic management (ATM) over oceanic and remote areas necessitates appropriate aeronautical surveillance and communication means, in order to meet the required communication performance for reduced separation minima, without modification to aircraft equipment;

b) that the availability of appropriate communication means is still an issue over oceanic and remote areas, where there is currently no suitable solution to provide aeronautical VHF services;

c) that, to meet the evolving requirements of modern civil aviation, satellite systems may be used for the relay of VHF communications compliant with International Civil Aviation Organization (ICAO) standards, operating under the aeronautical mobile (R) service (AM(R)S), in order to complement terrestrial communication infrastructures when aircraft are operating in oceanic and remote areas;

d) that the VHF channels have become congested in some areas and the new aeronautical mobile-satellite (R) service (AMS(R)S) system would need to operate in such a manner as not to constrain existing systems;

e) that the frequency band 1 087.7-1 092.3 MHz was allocated to the AMS(R)S (Earth-to-space) on a primary basis in order to extend reception of Automatic Dependent Surveillance-Broadcast (ADS-B) signals beyond terrestrial line-of-sight, thereby facilitating the availability of surveillance means anywhere in the world;

f) that aeronautical VHF communications, when available in geographically remote and oceanic areas, may be used in combination with satellite ADS-B to support radar-like separation of aircraft, thus greatly improving airspace capacity, efficiency and safety,

recognizing

a) that the frequency band 108-117.975 MHz is allocated on a primary basis to the aeronautical radionavigation service (ARNS), and to the AM(R)S in accordance with Resolution **413 (Rev.WRC-12)**;

b) that the frequency band 117.975-137 MHz is allocated on a primary basis to the AM(R)S and is used by air-ground, air-air and ground-air systems operated in accordance with ICAO Standards and Recommended Practices (SARPs), providing critical voice and data communications for ATM on a global basis;

c) that under Nos. **5.201** and **5.202**, the frequency bands 132-136 MHz and 136-137 MHz are also allocated in several countries to the aeronautical mobile (OR) service on a primary basis;

d) that the AM(R)S VHF frequency band (117.975-137 MHz) is currently used by air traffic communication and airline operational communication;

e) that the frequency band 117.975-137 MHz is only used by systems that operate in accordance with recognized international aeronautical standards,

noting

a) that Annex 10 to the Convention on International Civil Aviation contains SARPs for safety aeronautical radionavigation and radiocommunication systems used by international civil aviation;

b) that the development of compatibility criteria between new AMS(R)S systems proposed for operations in the frequency band 117.975-137 MHz and ICAO-standardized aeronautical systems in this frequency band is the responsibility of ICAO;

c) that there are SARPs developed by ICAO detailing frequency assignment planning criteria for VHF air-ground communication systems;

d) that feeder links of AMS(R)S systems may be accommodated in the fixed-satellite service,

resolves to invite the ITU Radiocommunication Sector

1 to define the relevant technical characteristics and to study, taking into account *considering c)* and taking into account No. **5.200**, compatibility between potential new AMS(R)S systems that operate within the frequency band 117.975-137 MHz in the Earth-to-space and space-to-Earth directions and existing primary services in that frequency band and in adjacent frequency bands, while ensuring the protection of systems using existing primary services in those frequency bands and not constraining planned usage of those systems;

2 to take into account the results of the studies to provide technical and regulatory recommendations relative to a possible new AMS(R)S allocation within the frequency band 117.975-137 MHz, taking into consideration the responsibility of ICAO referred to in *noting b)*,

invites the 2023 World Radiocommunication Conference

to consider the results of the studies and take appropriate actions, including a possible primary allocation to the AMS(R)S within the frequency band 117.975-137 MHz,

invites Member States and Sector Members

to participate actively in the studies and to submit the characteristics of any current and planned systems to be studied, as appropriate,

invites the International Civil Aviation Organization

to participate in the studies by providing aeronautical operational requirements and relevant available technical characteristics to be taken into account in ITU Radiocommunication Sector (ITU-R) studies and to take into account the sharing and compatibility conclusions reached at ITU-R in the SARPs to be developed for the AMS(R)S,

instructs the Secretary-General

to bring this Resolution to the attention of ICAO.

RESOLUTION 429 (WRC-19)

Consideration of regulatory provisions for updating Appendix 27 of the Radio Regulations in support of aeronautical HF modernization

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that for the purpose of this Resolution, the term "wideband" in HF communications may refer to a combination of multiple 3 kHz channels to provide improved data rates;

b) that, with the availability of advanced digital technologies and the demonstrated capabilities of aeronautical wideband HF, including contiguous or non-contiguous channel aggregation, faster data rates and better voice communications are possible;

c) that digital aeronautical HF must coexist with existing aeronautical analogue voice and data HF systems;

d) that desirable properties of HF propagation enable global coverage for aircraft;

e) that aeronautical analogue voice and narrowband digital HF systems are the primary means for international and domestic aviation to communicate with aircraft in remote and oceanic areas;

f) that there is an operational need for the modernization of data link services in the HF band for messages related to the safety and regularity of flight for use by international civil aviation;

g) that current aeronautical HF systems are limited by the available technology, and are insufficient to meet many modern aircraft information requirements without being augmented by aeronautical safety satellite communications;

h) that use of the frequencies in the frequency bands allocated to the aeronautical mobile (R) service (AM(R)S) in the frequency bands between 2 850 and 22 000 kHz is governed by the provisions of Appendix **27**,

recognizing

a) the need for improving aeronautical HF performance in support of internationally recognized aviation performance standards as defined by the International Civil Aviation Organization (ICAO);

b) that Annex 10 (Volume III) to the Convention on International Civil Aviation is a part of the international Standards and Recommended Practices (SARPs) for the current aeronautical narrowband HF communication systems used by international civil aviation;

c) that the modernization of aeronautical HF communications will not require any changes to Article **5** of the Radio Regulations;

d) that the frequencies 3 023 kHz and 5 680 kHz are designated for search and rescue in Appendix **15** of the Radio Regulations;

e) that any channel aggregation needs to be performed in a manner that protects other primary services operating in band and in adjacent frequency bands,

noting

a) the special arrangements clause in Appendix **27** for classes of emission other than J3E or H2B;

b) that the existing regional frequency allotments are detailed in Appendix **27** for aeronautical HF in the AM(R)S;

c) that Appendix **27** provides international and regional allotments for HF channels within the AM(R)S;

d) that the current aeronautical HF narrowband digital communications are detailed in Recommendation ITU-R M.1458;

e) that inter-system compatibility between internationally standardized aeronautical equipment is the responsibility of ICAO;

f) that new HF contiguous or non-contiguous channel aggregation technology allows for variable bandwidths greater than 3 kHz,

resolves to invite the ITU Radiocommunication Sector

1 to identify any necessary modifications to Appendix **27** for the AM(R)S between 2 850 and 22 000 kHz, noting *recognizing c)*;

2 to identify any necessary transition arrangements for the introduction of new digital aeronautical wideband HF systems and any consequential changes to Appendix **27**;

3 to recommend how new digital aeronautical wideband HF systems can be introduced while ensuring compliance with safety requirements and with *recognizing e)*;

4 to define the relevant technical characteristics and to conduct any necessary sharing and compatibility studies, taking into account *noting e)*, with incumbent services that are allocated on a primary basis in the same or adjacent frequency bands to avoid harmful interference in accordance with *recognizing e)*;

5 to complete the studies in time for WRC-23,

invites the 2023 World Radiocommunication Conference

to consider necessary changes to Appendix **27**, on the basis of the studies conducted under *resolves to invite the ITU Radiocommunication Sector* above,

instructs the Secretary-General

to bring this Resolution to the attention of the ICAO,

invites the International Civil Aviation Organization

to participate actively by providing aeronautical operational requirements and relevant available technical characteristics to be taken into account in ITU Radiocommunication Sector studies.

RESOLUTION 430 (WRC-19)

Studies on frequency-related matters, including possible additional allocations, for the possible introduction of new non-safety aeronautical mobile applications

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the number of aircraft equipped with sensors has grown significantly in the past 20 years;

b) that the need for bidirectional low to high data rate communications between aeronautical stations and aircraft stations, or between aircraft stations, is consequently increasing;

c) that the frequency bands to be considered should preferably be chosen close to frequency bands already used by aeronautical communication systems, in order to enable extended tuning ranges for such new aeronautical communication systems;

d) that these new aeronautical communications are not related to safety of flights;

e) that there is no clear identification of the frequency bands in which these new aeronautical communication systems may be developed with a sufficient level of confidence for long-term investment by industry;

f) that the decisions of previous conferences have introduced some restrictions on the use and imposed constraints on the development of these communication systems within several existing mobile allocations traditionally used by aeronautical mobile applications;

g) that the existing mobile allocations which can be used by these communication systems have some limitations due to coexistence with other services in the frequency band;

h) that in Region 1 there are allocations to the mobile, except aeronautical mobile, service in some frequency bands which are allocated to the mobile service in Regions 2 and 3;

i) that harmonized worldwide allocation would facilitate the implementation of these new aeronautical communication systems;

j) that an adaptation of the regulatory framework for further visibility, protection and development of non-safety aeronautical mobile applications may be required,

recognizing

a) that the use of innovative sharing methods may be considered to ensure the protection of existing services while offering the possibility to have access to new frequency bands;

b) that the introduction of the new aeronautical mobile systems in the possible new allocations should not impose constraints on existing and planned systems of primary services,

noting

a) that the frequency band 15.4-15.7 GHz is allocated on a primary basis to the radiolocation service, the aeronautical radionavigation service and, in part, the fixed-satellite service (Earth-to-space);

b) that the frequency band 22-22.21 GHz is allocated on a primary basis to the mobile, except aeronautical mobile, service;

c) that the frequency band 15.4-15.7 GHz is adjacent to the frequency band 15.35-15.4 GHz which is allocated to the radio astronomy service (RAS) on a primary basis;

d) that frequency band 22.01-22.21 GHz is adjacent to the frequency band 22.21-22.5 GHz which is allocated to the RAS, the Earth exploration-satellite service (passive) and the space research service (passive) on a primary basis;

e) that the frequency bands 22.01-22.21 GHz and 22.21-22.5 GHz are covered by No. **5.149**,

resolves to invite the ITU Radiocommunication Sector

to conduct, and complete in time for WRC-23:

1 studies on spectrum needs for new non-safety aeronautical mobile applications for air-air, ground-air and air-ground communications of aircraft systems;

2 sharing and compatibility studies in the frequency band 22-22.21 GHz, already allocated on a primary basis to the mobile, except aeronautical mobile, service, in order to evaluate the possible revision or deletion of the "except aeronautical mobile" restriction, while ensuring the protection of primary services in the frequency bands considered and, as appropriate, in adjacent frequency bands;

3 sharing and compatibility studies on possible new primary allocations to the aeronautical mobile service (AMS) for non-safety aeronautical applications in the frequency band 15.4-15.7 GHz, while ensuring the protection of primary services in the frequency bands considered and, as appropriate, in adjacent frequency bands;

4 definition of appropriate protection for the passive services and the RAS allocated in adjacent frequency bands from unwanted emissions of the AMS,

invites the 2023 World Radiocommunication Conference

to review the results of the ITU Radiocommunication Sector (ITU-R) studies and take appropriate actions,

invites administrations

to participate actively in the studies by submitting contributions to ITU-R.

RESOLUTION 656 (REV.WRC-19)

Possible secondary allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders in the range of frequencies around 45 MHz

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that spaceborne active radio-frequency sensors can provide unique information on physical properties of the Earth and other planets;

b) that spaceborne active remote sensing requires specific frequency ranges depending on the physical phenomena to be observed;

c) that there is an interest in using active spaceborne sensors in the vicinity of the frequency range 40-50 MHz for measurements of the Earth's subsurface to provide radar maps of subsurface scattering layers with the intent to locate water/ice/deposits;

d) that worldwide, periodic measurements of subsurface water deposits require the use of spaceborne active sensors;

e) that the frequency range 40-50 MHz is preferable to satisfy all requirements for spaceborne radar sounders;

f) that spaceborne radars are intended to be operated only in either uninhabited or sparsely populated areas of the globe, with particular focus on deserts and polar ice fields, and only at night-time from 3 a.m. to 6 a.m. locally,

recognizing

a) that the frequency range 40-50 MHz is allocated to the fixed, mobile and broadcasting services on a primary basis;

b) that the frequency range 40.98 to 41.015 MHz is used by the space research service on a secondary basis;

c) that country footnotes in the Table of Frequency Allocations for the frequency range 40-50 MHz provide primary allocations for the aeronautical radionavigation and radiolocation services in certain parts of the world;

d) that Recommendation ITU-R RS.2042-1 provides typical technical and operating characteristics for spaceborne radar sounder systems using the frequency range 40-50 MHz that should be used for interference and compatibility studies;

e) that Report ITU-R RS.2455-0 provides preliminary results of sharing studies between a 45 MHz radar sounder and incumbent fixed, mobile, broadcasting and space research services operating in the frequency range 40-50 MHz,

resolves to invite the 2023 world radiocommunication conference

to consider the results of studies on spectrum needs for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, and take appropriate action,

invites the ITU Radiocommunication Sector

to conduct studies on spectrum needs and sharing studies between the Earth exploration-satellite (active) service and the radiolocation, fixed, mobile, broadcasting, amateur and space research services in the frequency range 40-50 MHz and in adjacent bands,

invites administrations

to participate actively in the studies by submitting contributions to the ITU Radiocommunication Sector,

instructs the Secretary-General

to bring this Resolution to the attention of international and regional organizations concerned.

RESOLUTION 657 (REV.WRC-19)

Protection of radio spectrum-reliant space weather sensors used for global prediction and warnings

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that space weather observations are important for detecting solar activity events that impact services critical to the economy, safety and security of administrations and their population;

b) that these observations are made from ground-based and space-based systems;

c) that some of the sensors operate by receiving signals of opportunity, including, but not limited to, low-level natural emissions of the Sun, Earth's atmosphere and other celestial bodies, and therefore may suffer harmful interference at levels which could be tolerated by other radio systems;

d) that spectrum-reliant space weather sensor technology has been developed and operational systems have been deployed without much regard for domestic or international spectrum regulations, or for the potential need for protection from interference;

e) that a wide variety of spectrum-reliant space weather sensors currently operate relatively free of harmful interference; however, the radio interference environment could change as a result of changes made to the Radio Regulations;

f) that spectrum-reliant space weather sensors may be vulnerable to interference from both terrestrial and spaceborne systems;

g) that, while all spectrum-reliant space weather observation systems are important, the most critical need for radio regulatory protection is for those systems that are used operationally in the production of forecasts and warnings of space weather events that can cause harm to important sectors of national economies, human welfare and national security;

h) that frequency use is not consistent across the limited number of operational systems,

recognizing

a) that no frequency bands have been documented in any manner in the Radio Regulations for space weather sensor applications;

b) that Report ITU-R RS.2456-0, on space weather sensor systems using radio spectrum, contains a summary of spectrum-reliant space weather sensors and identifies the most critical operational systems (hereafter referred to as operational systems);

c) that the systems used for operational space weather monitoring, prediction and warnings documented in Report ITU-R RS.2456-0 are deployed globally;

d) that, while the number of systems is currently limited, the interest in and the importance of data from space weather monitoring systems is growing with time;

e) that certain, receive-only space weather applications may operate in a manner consistent with the definition of the meteorological aids (Metaids) service, but for scientific reasons observations cannot be conducted in frequency bands currently allocated to the Metaids service;

f) that the ITU Radiocommunication Sector (ITU-R) has a study Question ITU-R 256/7 to study the technical and operational characteristics, frequency requirements and appropriate radio service designation for space weather sensors,

noting

a) that any regulatory action associated with space weather sensor applications should take into account incumbent services that are already operating in the frequency bands of interest;

b) that ITU-R studies may show the protection of some systems to be a strictly national matter rather than requiring WRC action;

c) that, while data products are used for forecast and warnings related to public safety, among other purposes, the provisions of Nos. **1.59** and **4.10** do not apply to spectrum-reliant space weather sensors,

resolves to invite the ITU Radiocommunication Sector

1 to identify, in time for WRC-23, and based on existing and possible further ITU-R studies on the technical and operational characteristics, specific space weather sensors which need to be protected by appropriate regulation, including:

– to determine if receive-only space weather sensors shall be designated as applications of the Metaids service;

– to determine the appropriate radiocommunication service, if any, for cases where it is determined that receive-only space weather sensors do not fall under the Metaids service;

2 to conduct, in time for WRC-23, any necessary sharing studies with incumbent systems operating in frequency bands used by space weather sensors with the objective of determining potential regulatory provisions that can be provided to receive-only operational space weather sensors for their appropriate recognition in the Radio Regulations, while not placing additional constraints on incumbent services;

3 to develop potential solutions to describe in the Radio Regulations, in Articles **1** and **4**, and/or as a WRC resolution, if deemed appropriate, for consideration by WRC-23, space weather sensor systems and their corresponding usage, as well as protection requirements for receive-only space weather sensors;

4 to conduct studies, in time for WRC-23, on the technical and operational characteristics of active space weather sensors and conduct necessary sharing studies with incumbent systems operating in frequency bands used by active space weather sensors, with the objective of determining the appropriate radiocommunication service for those sensors,

instructs the Director of the Radiocommunication Bureau

to report on the results of the ITU-R studies to WRC-23,

invites administrations

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of the World Meteorological Organization and other international and regional organizations concerned.

RESOLUTION 661 (WRC-19)

Examination of a possible upgrade to primary status of the secondary allocation to the space research service in the frequency band 14.8-15.35 GHz

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the frequency band 14.8-15.35 GHz is currently allocated to the fixed and mobile services on a primary basis;

b) that the frequency band 14.8-15.35 GHz is currently allocated to the space research service (SRS) on a secondary basis;

c) that the frequency band 15.2-15.35 GHz is currently allocated to the Earth exploration-satellite service (EESS) (passive) and SRS (passive) on a secondary basis;

d) that the frequency band 15.35-15.4 GHz is currently allocated to the EESS (passive), the radio astronomy service and the SRS (passive) on a primary basis;

e) that there is a need for broadband communication downlinks in the SRS for the purpose of transmitting future scientific data at high data transmission speeds;

f) that a number of space agencies are already considering the possibility of using this frequency band for next-generation SRS satellites;

g) that, due to the small number of expected SRS earth stations that will be deployed worldwide (10-40 stations), coordination between fixed and land mobile communication systems and SRS stations will not impose excessive restrictions on any of the services;

h) that modern modulation methods together with the use of filters in high-speed data transmission links allow a significant reduction in out-of-band emissions, thereby minimizing possible interference for passive services in adjacent frequency bands;

i) that SRS operators must have stable regulatory certainty in order to be able to ensure long-term operation of systems in this service of public interest, and that operating on the basis of a secondary allocation conflicts with this objective;

j) that these space programmes represent long-term effort and investment that span across decades, from the time when the programme is officially decided, through the development period and the launch phase to the time when the corresponding satellites are in operation;

k) that space agencies are investing resources in the continuation of these programmes, providing subsequent satellites and payloads,

recognizing

a) that the frequency band 14.8-15.35 GHz is currently used by data relay satellites in inter-satellite links, which permits the establishment of communications with satellites in non-geostationary orbits (non-GSO), including manned flights in the SRS;

b) that the frequency band 14.8-15.35 GHz is also used by existing high-speed data links from non-GSO satellites within the SRS and is planned for use in future systems;

c) that these satellites are needed for the operation of telescopes and/or other passive instruments used for measuring such phenomena as the Earth's magnetosphere and solar flares;

d) that upgrading to primary status the allocation of the frequency band 14.8-15.35 GHz for the SRS will provide certainty for administrations and space agencies participating in satellite space programmes;

e) that upgrading to primary status the allocation of the frequency band 14.8-15.35 GHz for the SRS should not impose constraints on existing systems of primary services in the frequency band 14.8-15.35 GHz;

f) that the allocation to passive services mentioned in *considering c)* should be taken into account for protection,

noting

a) that Recommendations ITU-R M.2068 and ITU-R M.2089 contain characteristics of and protection criteria for systems operating in the land and aeronautical mobile services, respectively, in the frequency range 14.5-15.35 GHz;

b) that Recommendation ITU-R SA.1626 sets out the conditions for frequency sharing between the SRS (space-to-Earth) and the fixed and mobile services in the frequency band 14.8-15.35 GHz, including power flux-density (pfd) limits for the SRS;

c) that Recommendation ITU-R SA.510 sets out the conditions for frequency sharing between data relay systems operating in the SRS (space-to-space) and the fixed and mobile services in the frequency band 14.8-15.35 GHz, including pfd limits for the SRS,

resolves to invite the ITU Radiocommunication Sector

1 to investigate and identify all relevant scenarios mentioned in *recognizing a)* to *c)* that need to be considered in compatibility and sharing studies, taking into account the latest relevant ITU Radiocommunication Sector (ITU-R) Recommendations;

2 to conduct and complete in time for WRC-23 sharing and compatibility studies in order to determine the feasibility of upgrading the SRS allocation to primary status in the frequency band 14.8-15.35 GHz, with a view to ensuring protection of the primary services referred to in *considering a)* and *d)* and taking into account *recognizing e)*;

3 to determine the technical and regulatory conditions according to the results of the studies mentioned in *resolves to invite the ITU Radiocommunication Sector* 2,

invites administrations

to participate actively in the studies and provide the technical and operational characteristics of the systems involved by submitting contributions to ITU-R,

invites the 2023 World Radiocommunication Conference

to examine, on the basis of the results of studies by the ITU-R, the possibility of upgrading the secondary status of the allocation to the SRS to primary status in the frequency band 14.8-15.35 GHz, taking into account the studies referred to in *resolves to invite the ITU Radiocommunication Sector* 2 and the considerations in *resolves to invite the ITU Radiocommunication Sector* 3.

RESOLUTION 662 (WRC-19)

Review of frequency allocations for the Earth exploration-satellite service (passive) in the frequency range 231.5-252 GHz and consideration of possible adjustment according to observation requirements of passive microwave sensors

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that, within the frequency range 231.5-252 GHz, the frequency bands 235-238 GHz and 250-252 GHz are allocated to the Earth exploration-satellite service (EESS) (passive) for the use of passive microwave remote sensing systems;

b) that these allocations were agreed at WRC-2000, under agenda item 1.16 relating to Resolution **723 (WRC-97)**;

c) that scientific and technology developments for passive microwave sensor measurements have evolved over the last 20 years;

d) that it is appropriate to ensure that the frequency allocations to the EESS (passive) agreed in 2000 correspond to up-to-date observation requirements for passive microwave sensing,

recognizing

a) that some passive sensor systems under development plan to operate on some channels in the frequency range 239-248 GHz, given the specific characteristics of this frequency band for ice-cloud analysis;

b) that, as a result, it may be necessary to consider some adjustment/extension of the EESS (passive) allocations within the frequency range 231.5-252 GHz;

c) that the effect on the other primary services in the frequency range 231.5-252 GHz would have to be studied and the EESS (passive) allocations possibly adjusted,

resolves to invite the ITU Radiocommunication Sector

1 to review the existing primary allocations to the EESS (passive) in the frequency range 231.5-252 GHz in order to analyse if these allocations are aligned with the observation requirements of passive microwave sensors;

2 to study the impact that any change to the EESS (passive) allocations in the frequency range 231.5-252 GHz might have on the other primary services in these frequency bands;

3 to study, as appropriate, possible adjustments to the EESS (passive) allocations in the frequency range 231.5-252 GHz, taking into account the results under *resolves to invite the ITU Radiocommunication Sector* 1 above,

invites the 2023 World Radiocommunication Conference

to review the results of these studies with a view to adjusting existing allocations or adding possible new allocations, as appropriate, to the EESS (passive) in the frequency range 231.5-252 GHz without unduly constraining the other primary services currently allocated in this frequency range,

invites administrations

to participate actively in the studies by submitting contributions to the ITU Radiocommunication Sector,

instructs the Secretary-General

to bring this Resolution to the attention of the international and regional organizations concerned.

RESOLUTION 663 (WRC-19)

New allocations for the radiolocation service in the frequency band 231.5-275 GHz, and a new identification for radiolocation service applications in frequency bands in the frequency range 275-700 GHz

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that millimetre and sub-millimetre wave frequencies have been recognized by scientific communities and governmental organizations as well suited for stand-off detection of concealed objects;

b) that millimetre and sub-millimetre wave imaging systems will provide a significant contribution to public safety, counterterrorism and the security of high-risk/high-value assets or areas;

c) that millimetre and sub-millimetre wave imaging systems are typically designed in two main configurations: active (radars) and receive-only (radiometers);

d) that active millimetre and sub-millimetre wave imaging systems require a frequency bandwidth wider than 30 GHz to achieve range resolutions in the order of one centimetre;

e) that receive-only millimetre and sub-millimetre wave imaging systems detect the extremely weak power that is naturally radiated by objects and require a much wider frequency bandwidth than active systems to collect enough power for detection;

f) that globally harmonized spectrum for the millimetre and sub-millimetre wave imaging systems is required;

g) that the optimal frequency range for the operation of the active millimetre and sub-millimetre wave imaging systems is between 231.5 GHz and 320 GHz, where the atmospheric absorption is relatively low;

h) that there are some narrower existing allocations to the radiolocation service (RLS) in the frequency range 217-275 GHz in the three ITU Regions, which however do not support the bandwidth required for these systems;

i) that, for the receive-only millimetre and sub-millimetre wave imagers, an identification in the frequency range 275-700 GHz is envisaged;

j) that the frequency bands 235-238 GHz and 250-252 GHz are allocated to the Earth exploration-satellite service (EESS) (passive) on a primary basis;

k) that the frequency bands 241-248 GHz and 250-275 GHz are allocated to the radio astronomy service (RAS) on a primary basis;

l) that a number of frequency bands in the frequency range 275-1 000 GHz are identified for use by passive services, such as the RAS, the EESS (passive) and the space research service (SRS) (passive);

m) that No. **5.565** states that the use of the frequency range 275-1 000 GHz by the passive services does not preclude use of this frequency range by active services;

n) that administrations wishing to make frequencies available in the frequency range 275-1 000 GHz for active service applications are urged to take all practicable steps to protect the passive services from harmful interference until the date when the Table of Frequency Allocations is established for the relevant frequencies,

noting

a) that active millimetre and sub-millimetre wave imaging systems operate at very low transmit powers (a few milliwatts typically) and short ranges (up to 300 metres);

b) that millimetre and sub-millimetre wave imaging systems may be severely affected by other power sources operating in the same frequency band;

c) that the technical and operational characteristics for millimetre and sub-millimetre wave imaging systems need to be defined, including protection criteria in particular for receive-only systems,

resolves to invite the ITU Radiocommunication Sector

1 to study the future requirements for globally harmonized spectrum for the RLS, in particular for millimetre and sub-millimetre wave imaging applications above 231.5 GHz, as referred to in *considering a)* and *b)*;

2 to define technical and operational characteristics, including required protection criteria, for millimetre and sub-millimetre wave imaging systems;

3 to study sharing and compatibility of active millimetre and sub-millimetre wave imaging applications with other systems in the frequency range between 231.5 GHz and 275 GHz, while ensuring that the EESS (passive), SRS (passive) and RAS allocated in this frequency range are protected;

4 to conduct sharing and compatibility studies between RLS applications and EESS (passive), SRS (passive) and RAS applications operating in the frequency range 275-700 GHz, while maintaining protection of the passive service applications identified in No. **5.565**;

5 to study sharing and compatibility of receive-only millimetre and sub-millimetre wave imaging applications with other systems in the frequency range between 275 GHz and 700 GHz;

6 to study possible new allocations to the RLS on a co-primary basis in the frequency range between 231.5 GHz and 275 GHz, while ensuring the protection of existing services in the frequency bands considered and, as appropriate, adjacent frequency bands;

7 to study a possible identification of frequency bands in the frequency range 275-700 GHz for use by RLS applications;

8 to review studies under *resolves to invite the ITU Radiocommunication Sector* 1 to 7, and elaborate regulatory measures for the possible introduction of millimetre and sub-millimetre wave imaging systems;

9 to complete the studies in time for WRC-27,

invites the 2027 World Radiocommunication Conference

to review the results of these studies and take appropriate actions,

invites administrations

to participate actively in the studies by submitting contributions to the ITU Radiocommunication Sector.

RESOLUTION 664 (WRC-19)

Use of the frequency band 22.55-23.15 GHz by the Earth exploration-satellite service (Earth-to-space)

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the frequency band 25.5-27 GHz is allocated worldwide on a primary basis to the Earth exploration-satellite service (EESS) (space-to-Earth);

b) that an EESS (Earth-to-space) allocation in the frequency range 22.55-23.15 GHz would allow its use for satellite tracking, telemetry and control (TT&C) in combination with the existing EESS (space-to-Earth) allocation referred to in *considering a)*;

c) that an EESS (Earth-to-space) allocation in the 23 GHz frequency range would allow for uplinks and downlinks on the same transponder, increasing efficiency and reducing satellite complexity,

recognizing

a) that the frequency band 22.55-23.55 GHz is allocated to the fixed, inter-satellite and mobile services;

b) that the frequency band 22.55-23.15 GHz is also allocated to the space research service (SRS) (Earth-to-space);

c) that the SRS (Earth-to-space) allocation in the frequency band 22.55-23.15 GHz is paired with the SRS (space-to-Earth) allocation in the frequency band 25.5-27 GHz;

d) that the possible development of the EESS (Earth-to-space) in the frequency band 22.55-23.15 GHz should not constrain the use and development of the SRS (Earth-to-space) in this frequency band,

resolves to invite the ITU Radiocommunication Sector

1 to conduct sharing and compatibility studies between EESS (Earth-to-space) systems and the existing services mentioned in *recognizing a)* and *b)*, while ensuring the protection of, and not imposing undue constraints on, all services and future development of existing services, in the frequency band 22.55-23.15 GHz;

2 to complete the studies, taking into account the present use of the allocated frequency band, with a view to presenting, at the appropriate time, the technical basis for the work of WRC-27,

invites the 2027 World Radiocommunication Conference

to review the results of these studies with a view to providing a worldwide primary allocation to the EESS (Earth-to-space) in the frequency band 22.55-23.15 GHz,

invites administrations

to participate actively in the studies by submitting contributions to the ITU Radiocommunication Sector,

invites the Secretary-General

to bring this Resolution to the attention of the international and regional organizations concerned.

RESOLUTION 772 (WRC-19)

Consideration of regulatory provisions to facilitate the introduction of sub-orbital vehicles

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that sub-orbital vehicles are being developed which are intended to operate at higher altitudes than conventional aircraft, with a sub-orbital trajectory;

b) that sub-orbital vehicles are also being developed to fly through the lower levels of the atmosphere, where they are expected to operate in the same airspace as conventional aircraft;

c) that sub-orbital vehicles may perform various missions (e.g. conducting scientific research or providing transportation) and then return to the Earth's surface without completing a full orbital flight around the Earth;

d) that stations on board sub-orbital vehicles have a need for voice/data communications, navigation, surveillance and telemetry, tracking and command (TT&C);

e) that sub-orbital vehicles must be safely accommodated into airspace used by conventional aircraft during certain phases of flight;

f) that there is a need to ensure that equipment installed on such vehicles can communicate with air traffic management systems and relevant ground control facilities;

g) that vehicles operating at the boundary of space and the atmosphere or re-entering the atmosphere may generate a plasma sheath that may envelop all or most of the vehicle;

h) that the plasma-sheath attenuation does not allow for radiocommunications directly to either ground or space stations,

recognizing

a) that there is no internationally agreed legal demarcation between the Earth's atmosphere and the space domain;

b) that there is no formal definition of sub-orbital flight, although it has been assumed in Report ITU-R M.2477 to be an intentional flight of a vehicle expected to reach the upper atmosphere with a portion of its flight path that may occur in space without completing a full orbit around the Earth before returning back to the surface of the Earth;

c) that stations on board sub-orbital vehicles may use systems operating under space and/or terrestrial services;

d) that the current regulatory provisions and procedures for terrestrial and space services may not be adequate for international use of relevant frequency assignments by stations on board sub-orbital vehicles;

e) that Annex 10 to the Convention on International Civil Aviation contains Standards and Recommended Practices for aeronautical radionavigation and radiocommunication systems used by international civil aviation;

f) that the studies on spectrum requirements for voice/data communications, navigation, surveillance and TT&C on stations on board sub-orbital vehicles have not been completed;

g) that some space launch systems may include components or items not reaching orbital trajectories, and that some of these components or items may be developed as reusable items operating on sub-orbital trajectories;

h) that conventional space launch systems currently have a radiocommunication regulatory framework that may differ from the future radiocommunication framework of sub-orbital vehicles,

noting

a) Question ITU-R 259/5, on operational and radio regulatory aspects for planes operating in the upper level of the atmosphere;

b) that Report ITU-R M.2477 provides information on the current understanding of radiocommunications for sub-orbital vehicles, including a description of the flight trajectory, categories of sub-orbital vehicles, technical studies related to possible avionics systems used by sub-orbital vehicles, and service allocations of those systems;

c) that the provisions of No. **4.10** may apply to certain aspects of these operations;

d) that the development of compatibility criteria between International Civil Aviation Organization (ICAO) standardized aeronautical systems is the responsibility of ICAO;

e) that the definitions and future applicable radiocommunication services for sub-orbital vehicles should be clarified by the ITU Radiocommunication Sector (ITU-R), with necessary coordination with ICAO,

resolves to invite the ITU Radiocommunication Sector

1 to study spectrum needs for communications between stations on board sub-orbital vehicles and terrestrial/space stations providing functions such as, *inter alia*, voice/data communications, navigation, surveillance and TT&C;

2 to study appropriate modification, if any, to the Radio Regulations, excluding any new allocations or changes to the existing allocations in Article **5**, to accommodate stations on board sub-orbital vehicles, whilst avoiding any impact on conventional space launch systems, with the following objectives:

– to determine the status of stations on sub-orbital vehicles, and study corresponding regulatory provisions to determine which existing radiocommunication services can be used by stations on sub-orbital vehicles, if necessary;

– to determine the technical and regulatory conditions to allow some stations on board sub-orbital vehicles to operate under the aeronautical regulation and to be considered as earth stations or terrestrial stations even if a part of the flight occurs in space;

– to facilitate radiocommunications that support aviation to safely integrate sub-orbital vehicles into airspace and ensure interoperability with international civil aviation;

– to define the relevant technical characteristics and protection criteria for the studies to be undertaken in accordance with the bullet point below;

– to conduct sharing and compatibility studies with incumbent services that are allocated on a primary basis in the same and adjacent frequency bands in order to avoid harmful interference to other radiocommunication services and to existing applications of the same service in which stations on board sub-orbital vehicles operate, having regard to the sub-orbital flight application scenarios;

3 to identify, as a result of the studies above, whether there is a need for access to additional spectrum that should be addressed after WRC-23 by a future competent conference,

invites the International Civil Aviation Organization

to participate in the studies and provide to ITU the relevant technical characteristics required for the studies called for in *resolves to invite the ITU Radiocommunication Sector*,

invites the 2023 World Radiocommunication Conference

to consider the results of the studies above and take the appropriate action,

instructs the Director of the Radiocommunication Bureau

to bring this Resolution to the attention of the relevant ITU-R study groups,

invites administrations

to participate actively in the studies by submitting contributions to ITU-R,

instructs the Secretary-General

to bring this Resolution to the attention of the United Nations Committee on the Peaceful Uses of Outer Space and ICAO and other international and regional organizations concerned.

RESOLUTION 773 (WRC-19)

Study of technical and operational issues and regulatory provisions for satellite-to-satellite links in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz

The World Radiocommunication Conference (Sharm-el-Sheikh, 2019),

considering

a) that the definition of fixed-satellite service (FSS) in No. **1.21** includes the possibility, in some cases, of satellite-to-satellite links, which may also be operated in the inter-satellite service (ISS);

b) that the definition of ISS in No. **1.22** includes only links between space stations, and that the term *inter-satellite link* in this Resolution is taken to mean a radiocommunication service link between artificial satellites;

c) that frequency bands allocated to the FSS are used for links between earth stations and space stations, and that such links may not be operated in the ISS;

d) that using some frequency bands allocated to the FSS for transmissions between space stations may increase spectral efficiency in those frequency bands;

e) that there is growing interest for utilizing satellite-to-satellite links for a variety of applications and that there have been expressions of interest by some administrations in using the FSS frequency bands 27.5-30 GHz (Earth-to-space) and 11.7-12.7 GHz, 18.1-18.6 GHz and 18.8-20.2 GHz (space-to-Earth) for links between space stations;

f) that all FSS allocations include a space-to-Earth or Earth-to-space direction indicator;

g) that the ITU Radiocommunication Sector (ITU-R) has begun preliminary studies on the technical and operational issues associated with the use of non-geostationary (non-GSO) satellites transmitting towards the geostationary-satellite orbit (GSO) in the FSS frequency band 27.5-30 GHz, and that such studies are expected to continue in this frequency band and other frequency bands after this conference,

recognizing

a) that it is necessary to study the compatibility of satellite-to-satellite transmissions with other primary services in the frequency bands taking into account applicable footnotes, and the need to protect the primary services in the frequency bands referred to in *considering e)*;

b) that the use of the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz and 18.8-20.2 GHz (space-to-Earth) and 27.5-30 GHz (Earth-to-space) for transmissions between space stations should ensure compatibility with, and impose no additional regulatory or technical constraints on, services to which the frequency band is currently allocated on a primary basis and services using adjacent frequency bands allocated on a primary basis;

c) that it is necessary to study whether space-to-Earth direction transmissions from space stations at higher orbital altitudes, including GSO satellites, can be successfully received by lower orbital altitude non-GSO satellites, without imposing any additional constraints on all allocated services in these frequency bands;

d) that the sharing scenarios are likely to differ as the orbital characteristics of the non-GSO satellites vary;

e) that out-of-band emissions, signals due to antenna pattern sidelobes, reflections from receiving space stations and in-band unintentional radiation due to Doppler shifts may impact services operating in the same and adjacent frequency bands;

f) that some administrations have authorized these satellite-to-satellite transmission links under Article **4**, No. **4.4**, without recognition and on a non-harmful interference/non-protected basis,

recognizing further

a) that a precedent for satellite-to-satellite links sharing with Earth-to-space and space-to-Earth exists for the space operation (SOS), Earth exploration-satellite (EESS) and space research (SRS) services in the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz through the inclusion of a space-to-space allocation;

b) that the use of the frequency bands 27.5-28.6 GHz and 29.5-30 GHz by the non-GSO FSS is subject to the application of the provisions of Nos. **5.484A**, **22.5D** and **22.5I**;

c) that the use of the frequency bands 17.8-18.6 GHz and 19.7-20.2 GHz by the non-GSO FSS is subject to the application of the provisions of Nos. **5.484A**, **22.5C** and **22.5I**;

d) that use of the frequency band 28.6-29.1 GHz by GSO and non-GSO FSS networks is subject to the application of the provisions of No. **9.11A**, and No. **22.2** does not apply (see No. **5.523A**);

e) that No. **22.2** applies to the frequency bands 19.7-20.2 GHz and 29.5-30 GHz, in which the mobile-satellite service (MSS) has a co-primary allocation in Region 2 and in the 20.1-20.2 GHz and 29.9-30 GHz portions of the frequency bands in Regions 1 and 3;

f) that use of the frequency band 29.1-29.5 GHz (Earth-to-space) by the FSS is limited to GSO systems and feeder links to non-GSO systems in the MSS, and that such use is subject to the application of the provisions of No. **9.11A**, but not subject to the provisions of No. **22.2**, except as indicated in Nos. **5.523C** and **5.523E**, where such use is not subject to the provisions of No. **9.11A** and shall continue to be subject to Article **9** (except No. **9.11A**) and **11** procedures, and to the provisions of No. **22.2** (see No. **5.535A**);

g) that the frequency band 27.5-30 GHz may be used by the FSS (Earth-to-space) for the provision of feeder links for the broadcasting-satellite service (BSS) (see No. **5.539**);

h) that feeder links of non-GSO MSS networks and GSO FSS networks operating in the frequency band 29.1-29.5 GHz (Earth-to-space) shall employ uplink adaptive power control or other methods of fade compensation, such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between both networks (see No. **5.541A**);

i) that the fixed and mobile services are allocated on a primary basis in the frequency bands 10.7-11.7 GHz, 17.7-17.8 GHz, 18.1-19.7 GHz and 27.5-29.5 GHz on a global basis, in the frequency band 17.7-17.8 GHz in Regions 1 and 3, in the frequency band 12.2-12.7 GHz in Regions 2 and 3 and in the frequency band 11.7-12.5 GHz in Regions 1 and 3, and the fixed service is also primary in the frequency band 17.8-18.1 GHz globally and in the frequency band 11.7-12.1 GHz in Region 2;

j) that the frequency band 28.5-29.5 GHz (Earth-to-space) is also allocated to the EESS on a secondary basis, and no additional constraints should be imposed on the EESS, and the conditions of FSS operation are described in Resolution **750 (Rev.WRC-19)**;

k) that the allotments of the Appendix **30B** Plan, assignments in the Plans and the List subject to Appendix **30** and **30A** and assignments in the Appendix **30B** List must be protected;

l) that the frequency band 29.5-30 GHz (Earth-to-space) is also allocated to the MSS on a primary basis in the frequency band 29.5-30 GHz in Region 2, on a primary basis in the frequency band 29.9-30 GHz in Regions 1 and 3, and on a secondary basis in the frequency band 29.5-29.9 GHz in Regions 1 and 3;

m) that use of the frequency band 18.1-18.4 GHz by the FSS (Earth-to-space) is limited to GSO BSS feeder links (No. **5.520**);

n) that the use of the frequency band 17.8-18.4 GHz is subject to the application of No. **22.5F** and $epfd_{is}$ limits,

resolves to invite the ITU Radiocommunication Sector

1 to develop the technical and operational characteristics of different types of space stations that plan satellite-to-satellite transmissions in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, taking into account *considering e)* above;

2 to study the technical and operational characteristics, including spectrum requirements, off-axis equivalent isotropically radiated power (e.i.r.p.) values and out-of-band emission limits, for transmissions between space stations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz;

3 to study sharing and compatibility between satellite-to-satellite links intending to operate between space stations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz and current and planned stations of the FSS and other existing services allocated in same frequency bands and adjacent frequency bands, including passive services, with a view to ensuring protection of the primary services referred to in *recognizing further i)*;

4 to develop, for different types of space stations, the technical conditions and regulatory provisions for satellite-to-satellite operations in the frequency bands 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, or portions thereof, including new ISS allocations, as appropriate, taking into account the results of the studies above,

invites administrations

to participate in the studies and to provide input contributions,

invites the 2023 World Radiocommunication Conference

to consider the results of the above studies and take necessary regulatory actions, as appropriate.

RESOLUTION 774 (WRC-19)

Studies on technical and operational measures to be applied in the frequency band 1 240-1 300 MHz to ensure the protection of the radionavigation-satellite service (space-to-Earth)

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that the frequency band 1 240-1 300 MHz is allocated worldwide to the amateur service on a secondary basis;

b) that the amateur-satellite service (Earth-to-space) may operate in the frequency band 1 260-1 270 MHz under No. **5.282**;

c) that the frequency band 1 240-1 300 MHz is important for the amateur community and has been used for many years for a range of applications;

d) that the frequency band 1 240-1 300 MHz is also allocated worldwide to the radionavigation-satellite service (RNSS) in the space-to-Earth direction on a primary basis;

e) that RNSS systems using the frequency band 1 240-1 300 MHz are operational, or becoming operational, in various parts of the world, with the aim of supporting a wide range of new satellite positioning services, for example enhanced accuracy and position authentication,

noting

a) that Recommendation ITU-R M.1732 contains the characteristics of systems operating in the amateur and amateur-satellite services for use in sharing studies;

b) that Recommendation ITU-R M.1044 should be used as a guide in studies of compatibility between systems operating in the amateur and amateur-satellite services and systems operating in other services;

c) that Recommendation ITU-R M.1787 contains the description of RNSS systems and the technical characteristics of space stations operating in the frequency band 1 240-1 300 MHz;

d) that Recommendation ITU-R M.1902 contains the characteristics and protection criteria for RNSS (space-to-Earth) receivers operating in the frequency band 1 240-1 300 MHz,

recognizing

a) that some cases of harmful interference caused by emissions in the amateur service into RNSS (space-to-Earth) receivers have occurred, and resulted in investigations and in instructions to the operator of the interfering station to cease transmissions;

b) that the number of RNSS receivers in the frequency band 1 240-1 300 MHz is currently limited in certain regions, but will increase dramatically in the near future with the ubiquitous deployment of receivers used in mass-market applications;

c) that, in accordance with No. **5.29**, stations of a secondary service shall not cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date;

d) that administrations will benefit from the availability of studies and guidelines on protection of the RNSS (space-to-Earth) by the amateur and amateur-satellite services in the frequency band 1 240-1 300 MHz;

e) that some RNSS receivers in the frequency band 1 240-1 300 MHz may be equipped with pulse-blanking, which may facilitate sharing with certain amateur-service applications;

f) that the amateur service in the frequency band 1 240-1 300 MHz is currently used for amateur voice, data and image transmission in several countries in Europe and around the globe, and may transmit a variety of emission types including wideband, continuous and/or high equivalent isotropically radiated power (e.i.r.p.) transmissions,

resolves to invite the ITU Radiocommunication Sector

1 to perform a detailed review of the different systems and applications used in the amateur service and amateur-satellite service allocations in the frequency band 1 240-1 300 MHz;

2 taking into account the results of the above review, to study possible technical and operational measures to ensure the protection of RNSS (space-to-Earth) receivers from the amateur and amateur-satellite services in the frequency band 1 240-1 300 MHz, without considering the removal of these amateur and amateur-satellite service allocations,

instructs the Director of the Radiocommunication Bureau

to include the results of these studies in his Report to WRC-23 for the purpose of considering appropriate actions in response to *resolves to invite the ITU Radiocommunication Sector* above.

RESOLUTION 775 (WRC-19)

Sharing between stations in the fixed service and satellite services in the frequency bands 71-76 GHz and 81-86 GHz

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that WRC-2000 made a number of different allocation changes to the frequency bands 71-76 GHz and 81-86 GHz based on the requirements known at the time;

b) that the frequency bands 71-76 GHz and 81-86 GHz are allocated on a primary basis, among other services, to the fixed service globally;

c) that the frequency band 71-76 GHz is also allocated to the fixed-satellite service (FSS) (space-to-Earth) and the mobile-satellite service (MSS) (space-to-Earth) and the frequency band 74-76 GHz is allocated to the broadcasting-satellite service;

d) that the frequency band 81-86 GHz is also allocated to the FSS and MSS (Earth-to-space);

e) that sharing conditions between the fixed service and satellite services in the frequency bands 71-76 GHz and 81-86 GHz could not be fully developed at WRC-2000 due to lack of available information on these services at the time;

f) that now, nearly 20 years on, there have been a number of significant technology advances and changes in network requirements in the fixed service, and the frequency bands 71-76 GHz and 81-86 GHz have become strategically important frequency bands for high-capacity fixed-service links, including backhaul for future mobile networks;

g) that WRC-12 already addressed sharing and compatibility issues between the fixed service and passive services in the frequency bands 71-76 GHz and 81-86 GHz and relevant adjacent frequency bands,

recognizing

a) that there is now much more information available in the ITU Radiocommunication Sector (ITU-R) on the characteristics and deployment of fixed-service systems;

b) that there are an increasing number of satellite filings in the frequency bands 71-76 GHz and 81-86 GHz;

c) that Article **21** and other provisions of the Radio Regulations currently do not contain the necessary technical and regulatory provisions to protect the fixed-service use in the frequency bands 71-76 GHz and 81-86 GHz;

d) that Resolution **750 (Rev.WRC-19)** already contains necessary provisions to protect passive services in the frequency bands and adjacent frequency bands from emissions of the fixed service in the frequency bands 71-76 GHz and 81-86 GHz, and there is no intention to change these provisions;

e) that there is no intention to change the existing allocations or status of those allocations in Article **5** of the Radio Regulations for the frequency bands 71-76 GHz and 81-86 GHz,

resolves to invite the ITU Radiocommunication Sector

to conduct, as a matter of urgency and in time for WRC-27, the appropriate studies to determine power flux-density and equivalent isotropically radiated power limits in Article **21** for satellite services to protect the fixed service in the frequency bands 71-76 GHz and 81-86 GHz without unduly constraining satellite systems,

invites the 2027 World Radiocommunication Conference

to consider the results of studies and take necessary action,

invites administrations

to participate actively in the studies by submitting contributions to ITU-R.

RESOLUTION 776 (WRC-19)

Conditions for the use of the frequency bands 71-76 GHz and 81-86 GHz by stations in the satellite services to ensure compatibility with passive services

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that WRC-2000 made a number of different allocation changes to the frequency bands 71-76 GHz and 81-86 GHz based on the requirements known at the time;

b) that the frequency band 71-76 GHz is also allocated to the fixed-satellite service (FSS) (space-to-Earth) and the mobile-satellite service (MSS) (space-to-Earth) and the frequency band 74-76 GHz is allocated to the broadcasting-satellite service;

c) that the frequency band 81-86 GHz is also allocated to the FSS and MSS (Earth-to-space);

d) that the frequency bands 76-77.5 GHz, 79-81 GHz and 81-86 GHz are allocated to the radio astronomy service (RAS) on a primary basis;

e) that the frequency band 86-92 GHz is allocated to the Earth exploration-satellite service (EESS) (passive), the space research service (SRS) (passive) and the RAS, and that No. **5.340** applies in this frequency band;

f) that compatibility conditions between satellite services in the frequency bands 71-76 GHz and 81-86 GHz and passive services in the frequency bands and in adjacent frequency bands could not be fully developed at WRC-2000 due to lack of available information on satellite services at the time;

g) that WRC-12 already addressed sharing and compatibility issues between the fixed service and passive services in the frequency bands 71-76 GHz and 81-86 GHz and relevant adjacent frequency bands;

h) that Resolution **750 (Rev.WRC-19)** contains no provisions to protect the EESS (passive) in the frequency band 86-92 GHz from emissions of the space services in the frequency band 81-86 GHz;

i) that Resolution **739 (Rev.WRC-19)** contains no provisions to protect the RAS in adjacent frequency bands from emissions of the space services in the frequency bands 71-76 GHz and 81-86 GHz,

recognizing

a) that there are an increasing number of satellite filings in the frequency bands 71-76 GHz and 81-86 GHz;

b) that Resolution **731 (Rev.WRC-19)** calls for consideration of sharing and adjacent-band compatibility between passive and active services above 71 GHz;

c) that Resolution **750 (Rev.WRC-19)** already contains necessary provisions to protect passive services in the frequency bands and adjacent frequency bands from emissions of the fixed service in the frequency bands 71-76 GHz and 81-86 GHz, and there is no intention to change these provisions;

d) that there is no intention to change the existing allocations or status of those allocations in Article **5** of the Radio Regulations for the frequency bands 71-76 GHz and 81-86 GHz,

resolves to invite the ITU Radiocommunication Sector

to conduct the appropriate studies to determine the technical conditions for satellite services in the frequency band 81-86 GHz in order to protect the EESS (passive) and the SRS (passive) in the frequency band 86-92 GHz and the RAS in the frequency bands mentioned in *considering d)* and *e)* without unduly constraining satellite systems,

invites the 2027 World Radiocommunication Conference

to consider the results of studies and take necessary action,

invites administrations

to participate actively in the studies by submitting contributions to the ITU Radiocommunication Sector.

RESOLUTION 804 (REV.WRC-19)

Principles for establishing agendas for world radiocommunication conferences

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

considering

a) that, in accordance with No. 118 of the ITU Convention, the general scope of the agendas for world radiocommunication conferences (WRCs) should be established four to six years in advance;

b) Article 13 of the ITU Constitution relating to the competence and scheduling of WRCs and Article 7 of the Convention relating to their agendas;

c) that No. 92 of the Constitution and Nos. 488 and 489 of the Convention require conferences to be fiscally responsible;

d) that, in Resolution 71 (Rev. Marrakesh, 2002), concerning the strategic plan of the Union, the Plenipotentiary Conference noted the increasingly complex and lengthy agendas for world radiocommunication conferences;

e) that Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference and Resolution **72 (Rev.WRC-19)** recognize the positive contribution of regional telecommunication organizations and informal groups and the need for improved efficiency and fiscal prudence;

f) the relevant Resolutions of previous WRCs;

g) that Resolution ITU-R 2-8 describes the principles of the organization of the work of the Conference Preparatory Meeting (CPM), including the reporting of contributions concerning future agenda items for information,

noting

a) that the number of issues addressed in agendas for WRCs has been growing, and that some issues could not be resolved adequately in the time allotted to the conference, including conference preparations;

b) that some agenda items may have a greater impact on the future of radiocommunications than others;

c) that the human and financial resources of ITU are limited;

d) that there is a need to limit the agenda of conferences, taking account of the needs of developing countries, in a manner that allows the major issues to be dealt with equitably and efficiently;

e) that, in accordance with No. 90 of the Constitution, the interval between WRCs should normally be three to four years, to ensure that changes in technology and requirements of Member States are adequately reflected in conference agendas;

f) that administrations and regional telecommunication organizations need sufficient time to evaluate and examine the potential consequences of proposed new items for inclusion in the agendas of future WRCs,

resolves

1 that recommended agendas for future WRCs shall include a standing agenda item for the establishment of preliminary agendas for subsequent WRCs;

2 that the principles in Annex 1 to this Resolution should be used when developing future WRC agendas;

3 to encourage administrations and regional telecommunication organizations to submit, to the extent practicable, information on possible items/topics for the agenda of future WRCs under the WRC standing agenda item mentioned in *resolves* 1 to the second session of CPM,

invites administrations

1 to use the template in Annex 2 to this Resolution in proposing agenda items for WRCs;

2 to participate in regional activities for the preparation of future WRC agendas.

ANNEX 1 TO RESOLUTION 804 (REV.WRC-19)

Principles for establishing agendas for world radiocommunication conferences

1 A conference agenda shall include:

1.1 items assigned to it by the ITU Plenipotentiary Conference;

1.2 items on which the Director of the Radiocommunication Bureau (BR) has been requested to report;

1.3 items concerning instructions to the Radio Regulations Board and BR regarding their activities and concerning the review of those activities.

2 In general, a conference may include on a future conference agenda an item proposed by a group of administrations or an administration, if all the following conditions are met:

2.1 it addresses issues of a worldwide or regional character;

2.2 it is expected that changes in the Radio Regulations, including WRC Resolutions and Recommendations, may be necessary;

2.3 it is expected that required studies can be completed (e.g. that appropriate ITU Radiocommunication Sector (ITU-R) Recommendations will be approved) prior to that conference;

2.4 resources associated with the subject are kept within a range which is manageable for Member States and Sector Members, BR and ITU-R study groups and CPM.

3 Items that meet the requirements specified in section 2 of this Annex shall be included in the future WRC agenda as standalone items, and shall not be included as separate issues under the agenda item on which the Director of BR reports on ITU-R activities since the last WRC.

4 To the extent possible, agenda items arising from previous conferences, normally reflected in Resolutions, and which have been considered by two successive conferences, should not be considered, unless justified.

5 In addition, where possible, issues that could be addressed through actions undertaken by a Radiocommunication Assembly, particularly those not involving amendments to the Radio Regulations, should not be included in the agenda.

6 In developing the conference agenda, efforts should be made to:

a) encourage regional and interregional coordination on the subjects to be considered in the preparatory process for the WRC, in accordance with Resolution **72 (Rev.WRC-19)** and Resolution 80 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, with a view to addressing potentially difficult issues well before a WRC;

b) include, to the extent possible, agenda items that are prepared within regional telecommunication organizations, taking into account the equal right of individual administrations to submit proposals for agenda items;

c) ensure that proposals are submitted with an indication of priority;

d) include in proposals an assessment of their financial and other resource implications (with the assistance of BR) to ensure that they are within the agreed budgetary limits for ITU-R;

e) ensure that the objectives and scope of proposed agenda items are complete and unambiguous;

f) take into account the status of ITU-R studies related to the potential agenda items before considering them as possible candidates for future agendas;

g) distinguish between items intended to result in changes to the Radio Regulations and those dealing solely with the progress of studies;

h) arrange items on the agenda by subject to the extent possible.

ANNEX 2 TO RESOLUTION 804 (REV.WRC-19)

Template for the submission of proposals for agenda items

Subject:

Origin:

***Proposal*:**

***Background/reason*:**

***Radiocommunication services concerned*:**

***Indication of possible difficulties*:**

***Previous/ongoing studies on the issue*:**

***Studies to be carried out by*:**	***with the participation of*:**

***ITU-R study groups concerned*:**

***ITU resource implications, including financial implications (refer to CV126)*:**

***Common regional proposal*:** Yes/No	***Multicountry proposal*:** Yes/No ***Number of countries*:**

Remarks

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ISBN 978-92-61-36051-1

Published in Switzerland
Geneva, 2022
Photo credits: Shutterstock