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| **World Radiocommunication Conference (WRC-15)Geneva, 2–27 November 2015** |  |
| **INTERNATIONAL TELECOMMUNICATION UNION** |  |
|  |  |
| PLENARY MEETING | **Addendum 1 toDocument 103(Add.6)-E** |
|  | **19 October 2015** |
|  | **Original: English** |
|  |
| Japan |
| Proposals for the work of the conference |
|  |
| Agenda item 1.6.1 |

1.6 to consider possible additional primary allocations:

1.6.1 to the fixed-satellite service (Earth-to-space and space-to-Earth) of 250 MHz in the range between 10 GHz and 17 GHz in Region 1;

and review the regulatory provisions on the current allocations to the fixed-satellite service within each range, taking into account the results of ITU‑R studies, in accordance with Resolutions **151 (WRC‑12)** and **152 (WRC‑12)**, respectively;

Introduction

Based on the results of the frequency sharing study conducted by the ITU-R, for Agenda Item 1.6.1, this Administration supports the modification of the existing FSS allocation to open up frequency band 250 MHz wide in 14.5-14.8 GHz for uplink of the FSS (not limited to feeder link of the BSS; Method F2 ; Option (B) for the frequency sharing with the feeder link of the BSS, Option (A) for the frequency sharing with the MS) and supports additional allocation of 13.4-13.65 GHz to downlink of the FSS (Method EE2) provided that the EESS (active) are not constrained by the FSS. Although the latter part is already covered by the APT common proposals (ACP ; Addendum 1 to Document CMR15/32(Add.6)) and Japan supports the ACP on this agenda item, pfd limit for angles of arrival 70°-90° is still pending (see ‘Editor’s Note’ in ASP/32A6A1/14). Therefore, this document provides detailed discussion on sharing with EESS (active) in Annex to this document.

Proposals

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. 2.1)

MOD J/103A6A1/1

14-15.4 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 14.5-14.75 | FIXEDFIXED-SATELLITE (Earth-to-space) MOD 5.510 ADD 5.A16 ADD 5.B16MOBILESpace research ADD 5.C16 |
| 14.75-14.8FIXEDFIXED-SATELLITE (Earth-to-space) MOD 5.510 ADD 5.D16MOBILESpace research ADD 5.C16 | 14.75-14.8FIXEDFIXED-SATELLITE (Earth-to-space) MOD 5.510 ADD 5.A16 ADD 5.B16MOBILESpace research ADD 5.C16 |

**Reasons:** To allocate the band 14.5-14.75 GHz to the FSS (Earth-to-space) in Regions 1 and 2 and 14.5-14.8 GHz to the FSS (Earth-to-space) in Region 3.

MOD J/103A6A1/2

5.510 The use of the band 14.5-14.8 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service is subject to the provisions of Appendix **30A** for Regions 1 and 3 and is limited for countries outside Europe.     (WRC-15)

**Reasons:** In Regions 1 and 3 the frequency band 14.5-14.8 GHz is used by stations in the Plan or the List of frequency assignments for feeder links in the broadcasting satellite service. Such usage under RR Appendix **30A** is reserved for countries outside Europe.

ADD J/103A6A1/3

5.A16 The use of the band 14.5-14.75 GHz in Regions 1 and 2 and 14.5-14.8 GHz in Region 3 by the fixed-satellite service (Earth-to-space) is limited to geostationary-satellite systems.     (WRC‑15)

**Reasons:** To limit the usage of the frequency bands 14.5-14.75 GHz (Regions 1 and 2) and 14.5-14.8 GHz (Region 3) to GSO FSS systems (Earth-to-space).

ADD J/103A6A1/4

5.B16 For the use of the band 14.5-14.75 GHz in Regions 1 and 2, and 14.5-14.8 GHz in Region 3 by the fixed-satellite service (Earth-to-space) not subject to No. **5.510**, the fixed-satellite service earth stations shall have a minimum antenna diameter of [between 2.4 and 6] metres in Region 1, [between 2.4 and 6] metres in Region 2, and [between 2.4 and 6] metres in Region 3.     (WRC-15)

**Reasons:** Introduction of the restriction on minimum antenna diameter will reduce the percentage of the time during which protection criteria for the AMS may be exceeded. Moreover, this restriction makes the frequency coordination between the terrestrial networks and the FSS networks easier.

ADD J/103A6A1/5

5.C16 The band 14.5-14.8 GHz is also allocated to the space research service on a primary basis. However, such use is limited to satellite systems, operating in the space research service (Earth-to-space) to relay data to space stations in the geostationary-satellite orbit from associated earth stations, for which information for advance publication has been received by the Bureau prior to 27 November 2015. Stations in the space research service shall not cause harmful interference to nor claim protection from stations in the fixed, mobile services and stations in the fixed-satellite service limited to feeder links for the broadcasting satellite service operating under Appendix **30A** and feeder links for the broadcasting satellite service in Region 2.     (WRC-15)

**Reasons:** Due to existing deployment of the DRS in the SRS, the SRS is treated on equal basis with FSS. The current framework in the RR supports the coordination between the FSS and the SRS by applying the procedures and criteria associated with RR No. **9.7** by upgrading the SRS (Earth-to-space) allocation to primary vis-à-vis the FSS (not including FSS providing feeder links to BSS).

ADD J/103A6A1/6

5.D16 The use of the band 14.75-14.8 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links for the broadcasting-satellite service in Regions 1 and 2. This use is reserved for countries outside Europe.     (WRC-15)

**Reasons:** Allocation of the frequency band 14.75-14.8 GHz in Regions 1 and 2 is not changed.

APPENDIX 4 (REV.WRC‑12)

Consolidated list and tables of characteristics for use in the
application of the procedures of Chapter III

ANNEX 2

Characteristics of satellite networks, earth stations
or radio astronomy stations[[1]](#footnote-1)2     (Rev.WRC‑15)

Footnotes to Tables A, B, C and D

MOD J/103A6A1/7

**TABLE A**

GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION

| **Items in Appendix** | ***A \_ GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION***  | **Advance publication of a geostationary-satellite network** | **Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9** | **Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9** | **Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)**  | **Notification or coordination of a non-geostationary-satellite network** | **Notification or coordination of an earth station (including notification under Appendices 30A or 30B)**  | **Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)** | **Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)** | **Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)** | **Items in Appendix** | **Radio astronomy** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A.7.f | the antenna diameter, in metres Required only for fixed-satellite service earth stations operating in the frequency bands 13.75-14 GHz, 14.5-14.75 GHz, 14.75-14.8 GHz (Region 3), 24.65-25.25 GHz (Region 1) and 24.65-24.75 GHz (Region 3) |  |  |  |  |  |  **+ 1** |  |  |  | A.7.f |  |

MOD J/103A6A1/8

**TABLE C**

CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA

| **Items in Appendix** | ***C \_ CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA*** | **Advance publication of a geostationary-satellite network** | **Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9** | **Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9** | **Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)**  | **Notification or coordination of a non-geostationary-satellite network** | **Notification or coordination of an earth station (including notification under Appendices 30A or 30B)**  | **Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)** | **Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)** | **Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)** | **Items in Appendix** | **Radio astronomy** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C.10.d.7 | the antenna diameter, in metresIn cases other than Appendix **30A**, required for fixed-satellite service networks operating in the frequency bands 13.75-14 GHz, 14.5-14.75 GHz, 14.75-14.8 GHz (Region 3), 24.65-25.25 GHz (Region 1) and 24.65-24.75 GHz (Region 3) and for maritime mobile-satellite service networks operating in the frequency band 14-14.5 GHz |  |  |  | **+** | **+** |  |  | **X** |  | C.10.d.7 |  |

APPENDIX 5 (REV.WRC‑12)

Identification of administrations with which coordination is to be effected or
agreement sought under the provisions of Article 9

MOD J/103A6A1/9

TABLE 5-1     (Rev.WRC‑15)

Technical conditions for coordination

(see Article 9)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ReferenceofArticle 9 | Case | Frequency bands(and Region) of the service for which coordinationis sought | Threshold/condition | Calculation method | Remarks |
| No. **9.7**GSO/GSO | A station in a satellite network using the geostationary-satellite orbit (GSO), in any space radiocommunication service, in a frequency band and in a Region where this service is not subject to a Plan, in respect of any other satellite network using that orbit, in any space radiocommunication service in a frequency band and in a Region where this service is not subject to a Plan, with the exception of the coordination between earth stations operating in the opposite direction of transmission | 1) 3 400-4 200 MHz5 725-5 850 MHz (Region 1) and5 850-6 725 MHz7 025-7 075 MHz | i) Bandwidth overlap, andii) any network in the fixed-satellite service (FSS) and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±8° of the nominal orbital position of a proposed network in the FSS |  | With respect to the space services listed in the threshold/condition column in the bands in 1), 2), 3), 4), 5), 6), 7) and 8), an administration may request, pursuant to No. **9.41**, to be included in requests for coordination, indicating the networks for which the value of Δ*T*/*T* calculated by the method in § 2.2.1.2 and 3.2 of Appendix **8** exceeds 6%. When the Bureau, on request by an affected administration, studies this information pursuant to No. **9.42**, the calculation method given in § 2.2.1.2 and 3.2 of Appendix **8** shall be used |
| 2) 10.95-11.2 GHz11.45‑11.7 GHz 11.7-12.2 GHz (Region 2)12.2-12.5 GHz (Region 3)12.5‑12.75 GHz (Regions 1 and 3) 12.7‑12.75 GHz (Region 2) and 13.75‑14.5 GHz | i) Bandwidth overlap, andii) any network in the FSS or broadcasting-satellite service (BSS), not subject to a Plan, and any associated space operation functions (see No. **1.23**) with a space station within an orbital arc of ±7° of the nominal orbital position of a proposed network in the FSS or BSS, not subject to a Plan |

TABLE 5-1 (*continued*)     (Rev.WRC‑15)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ReferenceofArticle 9 | Case | Frequency bands(and Region) of the service for which coordinationis sought | Threshold/condition | Calculation method | Remarks |
| No. **9.7**GSO/GSO(*cont.*) |  | 3) 14.5-14.8 GHz | i) Bandwidth overlap, andii) any network in the space research service (SRS) or FSS not subject to a Plan and any associated space operation functions (see No. 1.23) with a space station within an orbital arc of ±7° of the nominal orbital position of a proposed network in the FSS not subject to a Plan |  |  |

**Reasons:** To define the procedure for coordination under the provisions of RR No. 9.7 between the newly notified FSS networks and SRS networks (Earth-to-space, space-to-space).

APPENDIX 30A (REV.WRC‑12)\*

Provisions and associated Plans and List1 for feeder links for the broadcasting-satellite service (11.7-12.5 GHz in Region 1, 12.2-12.7 GHz
in Region 2 and 11.7-12.2 GHz in Region 3) in the frequency bands
14.5-14.8 GHz2 and 17.3-18.1 GHz in Regions 1 and 3,
and 17.3-17.8 GHz in Region 2     (WRC‑03)

ARTICLE 4     (Rev.WRC‑03)

Procedures for modifications to the Region 2 feeder-link Plan
or for additional uses in Regions 1 and 3

MOD J/103A6A1/10

## 4.1 Provisions applicable to Regions 1 and 3

4.1.1 An administration proposing to include a new or modified assignment in the feeder-link List shall seek the agreement of those administrations whose services are considered to be affected, i.e. administrations4, 5:

*a)* of Regions 1 and 3 having a feeder-link frequency assignment in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service which is included in the Regions 1 and 3 feeder-link Plan with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment; *or*

*b)* of Regions 1 and 3 having a feeder-link frequency assignment included in the feeder-link List or for which complete Appendix **4** information has been received by the Radiocommunication Bureau in accordance with the provisions of § 4.1.3, and any portion of which falls within the necessary bandwidth of the proposed assignment; *or*

*c)* of Region 2 having a feeder-link frequency assignment in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service which is in conformity with the Region 2 feeder-link Plan, or in respect of which proposed modifications to that Plan have already been received by the Bureau in accordance with the provisions of § 4.2.6 with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment; *or*

*d)* having a feeder-link frequency assignment in the band 17.8-18.1 GHz in Region 2 in the fixed-satellite service (Earth-to-space) to a space station in the broadcasting-satellite service or a frequency assignment in the band 14.5-14.8 GHz in the fixed-satellite service (Earth-to-space) not subject to this Appendix which is recorded in the Master Register or which has been coordinated or is being coordinated under the provisions of No. 9.7, or under § 7.1 of Article 7, with a necessary bandwidth, any portion of which falls within the necessary bandwidth of the proposed assignment.     (WRC‑15)

**Reasons:** Administration having proposed to include in the List for feeder links a new or modified frequency assignments shall seek agreement of administrations having the frequency assignments of unplanned FSS in the frequency band 14.5-14.8 GHz. Therefore after WRC-15 to include new (modified) frequency assignments in the frequency band 14.5-14.8 GHz will require coordination with the notified (priority by notification date) frequency assignments of unplanned FSS.

MOD J/103A6A1/11

ARTICLE 7     (Rev.WRC‑15)

Coordination, notification and recording in the Master International
Frequency Register of frequency assignments to stations in the fixed-satellite service (space-to-Earth) in Region 1 in the band 17.3-18.1 GHz and in
Regions 2 and 3 in the band 17.7-18.1 GHz, to stations in the fixed-satellite service (Earth-to-space) in Region 2 in the band 17.8-18.1 GHz, to stations
in the fixed-satellite service (Earth-to-space) in all Regions in the band
14.5-14.8 GHz where those stations are not subject to the Regions 1 and 3
feeder-link Plan or List and to stations
in the broadcasting-satellite service in Region 2 in the band 17.3-17.8 GHz
when frequency assignments to feeder links for broadcasting-satellite
stations in the 14.5-14.8 GHz, 17.3-18.1 GHz bands in Regions 1 and 3
or in the band 17.3-17.8 GHz in Region 2 are involved[[2]](#footnote-2)28

Section I – Coordination of transmitting space or earth stations in the fixed-satellite
service or transmitting space stations in the broadcasting-satellite service
with assignments to broadcasting-satellite service feeder links

7.1 The provisions of No. 9.7[[3]](#footnote-3)29and the associated provisions under Articles 9 and 11 are applicable to transmitting space stations in the fixed-satellite service in Region 1 in the band 17.3-18.1 GHz, to transmitting space stations in the fixed-satellite service in Regions 2 and 3 in the band 17.7-18.1 GHz, to transmitting earth stations in the fixed-satellite service in Region 2 in the band 17.8‑18.1 GHz, to transmitting earth stations in the fixed-satellite service in any region in the band 14.5-14.8 GHz where those stations are not subject to the Regions 1 and 3 feeder link Plan or List and to transmitting space stations in the broadcasting-satellite service in Region 2 in the band 17.3‑17.8 GHz.    (Rev.WRC‑15)

7.2 In applying the procedures referred to in § 7.1, the provisions of Appendix 5 are replaced by the following:

7.2.1 The frequency assignments to be taken into account are:

*a)* the assignments in conformity with the appropriate Regional feeder-link Plan in Appendix 30A;

*b)* the assignments included in the Regions 1 and 3 feeder-link List;

*c)* the assignments for which the procedure of Article 4 has been initiated as from the date of receipt of the complete Appendix 4 information under § 4.1.3 or 4.2.6.     (WRC‑03)

7.2.2 The criteria to be applied are those given in Annex 4.

7.2*bis* In applying the procedures referred to in § 7.1 for FSS frequency assignments in the band 14.5-14.8 GHz not subject to the Regions 1 and 3 feeder link Plan or List, the provision of No. **11.41** is replaced by the following provision. No. **11.41.2** continues to apply.

7.2*bis.1* If, after a notice is returned under No. **11.38**, should the notifying administration resubmit the notice and insist upon its reconsideration, and the assignment which was the basis of the unfavourable finding is neither an assignment in the Regions 1 and 3 Plan nor an assignment of definitive recording in the Regions 1 and 3 feeder-link List at the time when the notice is returned under No. **11.38**, the Bureau shall enter the assignment in the Master Register with an indication of those administrations whose assignments were the basis of the unfavourable finding (see also No. **11.42**).

**Reasons:** Administration having proposed to include in the List for feeder links a new or modified frequency assignments shall seek agreement of administrations having the frequency assignments of unplanned FSS in the frequency band 14.5-14.8 GHz. Therefore after WRC-15 to include new (modified) frequency assignments in the frequency band 14.5-14.8 GHz will require coordination with the notified (priority by notification date) frequency assignments of unplanned FSS.

To determine the notification and recording procedure for frequency assignments of unplanned FSS in case the notice is returned with unfavourable finding under RR No.11.38. In this case (unfavourable finding with respect to the provisions of Nos. **11.32А** or **11.33**) the provisions of No.**11.41** are replaced by the provision specified in new paragraph 7.2*bis*.1 of Section 1 Article 7 in RR Appendix **30A** (No. **11.41.2** is continued to be applied).

Under new provision if after the notice is returned in accordance with No.**11.38** the notifying administration resubmits the notice and insists upon its reconsideration and the assignment which was the basis of the unfavourable finding is not an assignment for feeder links in the Regions 1 and 3 Plan, the Bureau shall enter the assignment in the Master Register with an indication of those administrations whose assignments were the basis of the unfavourable finding.

Thus the frequency assignment of unplanned FSS in the frequency band 14.5-14.8 GHz in case of unfavourable finding can be reconsidered and entered in the Master Register only if the assignment which was the basis of the unfavourable finding is not an assignment for feeder links in the Regions 1 and 3 Plan.

ANNEX 1

Limits for determining whether a service of an administration is considered
to be affected by a proposed modification to the Region 2 feeder-link Plan
or by a proposed new or modified assignment in the Regions 1 and 3
feeder-link List or when it is necessary under this Appendix to seek
the agreement of any other administration     (Rev.WRC‑03)

NOC J/103A6A1/12

# 4 Limits to the interference into frequency assignments in conformity with the Regions 1 and 3 feeder-link Plan or with the Regions 1 and 3 feeder-link List or proposed new or modified assignments in the Regions 1 and 3 feeder-link List     (WRC‑03)

**Reasons:** Feeder link of the BSS can be adequately protected without modification of this section. Furthermore, modification proposed in the CPM Report as “Option (C)” requires the merger of the database for the Plan and database for the non-Plan and seems to be not feasible.

MOD J/103A6A1/13

# 6 Limits applicable to protect a frequency assignment in the band 17.8-18.1 GHz (Region 2) to a receiving feeder-link space station inthe fixed-satellite service (Earth-to-space) or a frequency assignment in the band 14.5-14.8 GHz (all regions where the frequency assignment is not subject to the Regions 1 and 3 feeder-link Plan or List) to a receiving space station in the fixed-satellite service (Earth-to-space)     (Rev.WRC‑15)

With respect to § 4.1.1 *d)* of Article 4, an administration is considered affected by a proposed new or modified assignment in the Regions 1 and 3 feeder-link List when the power flux-density arriving at the receiving space station of a broadcasting-satellite feeder-link in Region 2 or at the receiving space station of the fixed-satellite service uplinks not subject to the Regions 1 and 3 feeder-link Plan or List, in all regions of that administration would cause an increase in the noise temperature of the receiving space station which exceeds the threshold value of Δ*T*/*T* corresponding to 6%, where Δ*T*/*T* is calculated in accordance with the method given in Appendix 8, except that the maximum power densities per hertz averaged over the worst 1 MHz are replaced by power densities per hertz averaged over the necessary bandwidth of theuplink carriers.     (Rev.WRC‑15)

**Reasons:** To determine the limits applied for protection of frequency assignments of receiving space station in the unplanned FSS in the frequency bands 14.5-14.75 GHz (Regions 1 and 2) and 14.5-14.8 GHz (Region 3) when such assignment is affected by the proposed new or modified assignment for feeder links in the Regions 1 and 3 List. Administration is considered to be affected if the power flux density to receiving space station in the unplanned FSS (Earth-to-space) of this administration will lead to increase of the noise temperature of the receiving station in uplink exceeding the threshold level ΔT/T of 6%.

ANNEX 4     (Rev.WRC‑03)

Criteria for sharing between services

ADD J/103A6A1/14

# 3 Threshold values for determining when coordination is required between, transmitting earth stations in the fixed-satellite service in 14.5-14.8 GHz not subject to the Regions 1 and 3 feeder-link Plan or List and a receiving space station in the Regions 1 and 3 feeder-link Plan or List or a proposed new or modified receiving space station in the List, in the frequency band 14.5-14.8 GHz     (WRC-15)

With respect to § 7.1, Article 7, coordination of a transmitting earth station in the fixed-satellite service with a receiving space station in a broadcasting-satellite feeder link in the Regions 1 and 3 feeder-link Plan or List, or a proposed new or modified receiving space station in the List, is required when the power flux-density arriving at the receiving space station of a broadcasting-satellite service feeder link of another administration exceeds the value of −193.9 − GRx dB(W/(m2 · Hz))     (WRC-15)

Where GRx is the relative receive antenna gain of the space station in the Regions 1 and 3 feeder-link Plan or List at the location of the transmitting earth station in the fixed-satellite service not subject to Regions 1 and 3 feeder-link Plan or List.     (WRC-15)

**Reasons:** to define a new trigger based on studies conducted under this agenda item identifying the requirement to coordinate assignments of the unplanned FSS with assignments in, or proposed modifications to, the AP 30A Plan/List, in the band 14.5-14.8 GHz.

SUP J/103A6A1/15

RESOLUTION 151 (WRC‑12)

Additional primary allocations to the fixed-satellite service
in frequency bands between 10 and 17 GHz in Region 1

**Reasons:** This resolution is proposed to be suppressed considering the finalization of the studies on WRC-15 agenda item 1.6.1.

Annex

Frequency sharing between the FSS (space-to-Earth) and the EESS (active) in the 13.4-13.65 GHz band

# 1 Introduction

APT member countries commonly proposes the modification to Table 21-4 of the Radio Regulations as ASP/32A6A1/14 in Addendum 1 to Document CMR15/32(Add.6) with an *Editor’s Note* ‘A suitable maximum pfd limit value of the FSS downlink maybe needed in order to protect the EESS(active). This value could be decided in the WRC-15.’. Japan believes that the proposed pfd limit (-122 dB(W/m2) per 1 MHz) should adequately protect the EESS (active) sensors since several studies conducted in the ITU-R confirm relevance of this limit. Although few studies conclude that the aforementioned pfd limit could not provide protection to the EESS (active) sensors, Japan found that these studies have some technical flaws which might have caused misunderstanding that the EESS (active) will not be protected.

# 2 Summary of the ITU-R study

For static analysis, study 1 for scenario 2 in Report ITU-R S.2365 with respect to the altimeter (JASON) and study 3 with respect to precipitation radars conclude that the protection requirement of the EESS (active) will be exceeded. Among these sensors, a dynamic simulation shows the compatibility will be achieved between JASON altimeter and GSO/FSS networks, while another dynamic simulation concludes that the protection requirement of the precipitation radars will be exceeded. Since all the other studies show the compatibility, Japan further investigates the studies on the precipitation radars.

# 3 Discussion

## 3.1 Static analysis

According to ‘Static analysis n°3 for scenario 2’ (section 8.2.1.10.1.1 of Report ITU-R S.2365), the protection requirement of the EESS (active) will be exceeded by 1.89-6.85 dB assuming the scattering coefficient is 15.8-18.9 dB. It means that, if the scattering coefficient is smaller than 12 dB, the protection requirement will be met. The section 8.2.1.6 of Report ITU-R S.2365 shows that the scattering coefficient for soil does not exceed 12 dB. On the other hand, Figure 8-12 of the same ITU-R Report shows the dependency of the scattering coefficient on the incident angle although the expert group on active sensors within ITU-R (WP 7C) did not indicate the possibility to review the data. According to the Figure, the scattering coefficient will exceed 12 dB when the incident angle is smaller than approximately 3 degrees. It means that if all the following conditions are met, the scattering coefficient will exceed 12 dB:

1 GSO/FSS satellites cover areas with latitude smaller than 2.5 degrees (where the elevation angle of GSO satellites is larger than 97 degrees);

2 EESS satellites fly over the areas with latitude and relative longitude from the GSO/FSS satellite smaller than 2.7 degrees (where the look angle of the EESS satellites towards the area on the Earth mentioned in item 1 is smaller than 3 degrees);

3 The sensors on board EESS satellites scan the range of look angle smaller than 3 degrees.

Japan believes that the time percentage in which all the above-mentioned conditions can be met is very low. Moreover, it is unrealistic to assume that all the GSO/FSS satellites, which carry payloads using the 13.4-13.65 GHz band, cover areas within latitude smaller than 2.5 degrees with maximum permitted power and the distribution of the landmass and communications traffic is focused on the equatorial region. Therefore, Japan also believes that EESS (active) sensors will be adequately protected by the proposed pfd limit taking into account more practical implementation of the GSO/FSS satellites.

## 3.2 Dynamic simulation

There are following descriptions for ‘dynamic analysis n°2 between Precipitation radar and FSS (space to Earth)’ in section 8.2.1.10.1.2 of Report ITU-R S.2365:

*It can be noted that this mask is less stringent as the e.i.r.p. limitations already proposed in the corresponding method in the CPM report. The angle of arrival is understood to be the elevation angle of the satellite as seen from the earth.*

*The GPM DPR orbits are simulated during 4 days with a time step of 0.6 second. The GPM locations in this latitude range are used to simulate the aggregate interference.*

*Concerning the deployment model, each FSS satellite is pointing at the nadir direction covers all visible area with the e.i.r.p.s mentioned above. All FSS earth stations are located at the equator and at the same longitude of the corresponding GSO satellites.*

*Taking into account the geometry of the precipitation radar and each point on the Earth, the corresponding incidence angle as seen by the radar is computed and employed in the calculations of the interference power regardless of the incident angle of the signal from the FSS satellites. Then, using the data as shown in figure 8-12, the appropriate scattering coefficients are computed.*

The first paragraph means that this study does not evaluate proposed pfd value (-122 dB(W/m2) per 1 MHz).

With respect to the description of the third paragraph, taking into account the limitation in the performance of the satellites and/or inter-network interference, it is unrealistic to assume that all the 120 GSO/FSS satellites located with 3-degree orbital spacing in GSO arc cover entire visible areas with maximum permitted power. Additionally, it is also unrealistic to assume that all the GSO/FSS satellites cover equatorial areas and the distribution of the landmass and communications traffic is focused on these areas.

According to the fourth paragraph, this study employ the scattering coefficient for small incident angles even though the incident angle of the radiation from the GSO/FSS satellites are very large (elevation angle is very small). But this assumption is not adequate because the data in Figure 8-12 is collected in completely different geometry.

From the aforementioned reasons, this dynamic simulation is based on a conservative and impractical assumptions and therefore you cannot say that the EESS (active) will not be protected based on this study.

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1. 2 The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the BR IFIC (Space Services).     (WRC‑12) [↑](#footnote-ref-1)
2. 28 These provisions do not replace the procedures prescribed in Articles **9** and **11** when stations other than those for feeder links in the broadcasting-satellite service subject to a Plan are involved.     (WRC‑03) [↑](#footnote-ref-2)
3. 29 The provisions of Resolution **33 (Rev.WRC‑97)**\* are applicable to space stations in the broadcasting-satellite service for which the advance publication information or the request for coordination has been received by the Bureau prior to 1 January 1999.

\* *Note by the Secretariat*: This Resolution was revised by WRC‑03. [↑](#footnote-ref-3)