|  |  |  |  |
| --- | --- | --- | --- |
| **34 MEETING OF PERMANENT**  **CONSULTATIVE COMMITTEE II:**  **RADIOCOMMUNICATIONS**  **August 12-16, 2019**  **Ottawa, Canada** | | **OEA/Ser.L/XVII.4.2.33**  **CCP.II-RADIO/doc. 4357-1-5/19/REV**  **26 July 2019**  **Original: English** | |
|  | | | |
|  | **REVISION OF DRAFT INTER-AMERICAN PROPOSAL ON WRC-19 AGENDA ITEM 1.5** | |  |
|  | **(Item on the Agenda: 3.1 (SGT3))** | |  |
|  | **(Document submitted by Coordinator)** | |  |

**SGT-3 – Satellite regulatory**

**Coordinator: Brandon MITCHELL - USA**

**Co-Coordinator: Juan MASCIOTRA – ARG; Chantal BEAUMIER - CAN**

**Rapporteur Agenda Item: Robert NELSON - USA**

**Alternate Rapporteur Agenda Item: Gustavo VARGAS - COL**

**Source: Document 4874/19**

***Agenda item 1.5 of WRC-19****: to consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution 158 (WRC-15);*

**Background**

Earth stations in motion (ESIM) currently serve a wide range of applications, both on board aircraft and ships and on land and, considering that users expect to be able to connect wherever they are, the broadband service satellite is a key component in meeting that demand.

The 2015 World Radiocommunication Conference (WRC-15) adopted Note No. 5.527A, through which the operation of ESIMs that communicate with geostationary satellite (GSO) networks of the Fixed Satellite Service (SFS) in the frequency bands 29.5-30.0 GHz (Earth-to-space) and 19.7-20.2 GHz (space-to-Earth) under Resolution 156.

However, recognizing the growing demand for mobile services and the global availability of satellite broadband, WRC-2015 adopted WRC-19 Agenda Item 1.5 to consider ESIM operation in the frequency bands 27.5-29.5 GHz (Earth-to-space) and 17.7-19.7 GHz (space-to-Earth) of the FSS, thereby using more spectrum to meet the ESIM demand.

Results of the ITU Radiocommunication Sector (ITU-R)

The bands 17.7-19.7 GHz and 27.5-29.5 GHz are currently allocated to the FSS, among other services, and used by GSO Satellite FSS networks. These bands are shared with other services, including (in some sub-bands) non-geostationary orbital satellite (non-GSO) satellite FSS systems, feeder links for non-GSO systems for the mobile-satellite service and terrestrial systems.

To protect other services assigned in these bands, different use conditions must be applied to the different types of ESIM, since scenarios of interference from other services will be different for maritime, aeronautical and terrestrial ESIM.

The results of the sharing studies on the ESIM and the existing services in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz are described below:

The ITU-R reviewed the sharing conditions for ESIM with terrestrial services in the band 17.7-19.7 GHz and concluded that terrestrial service transmitters could potentially interfere with ESIM receivers. Therefore, ESIM should operate under the condition of not claiming protection from terrestrial services operating in accordance with the RR.

In the case of the frequency band 27.5-29.5 GHz, the ITU-R reviewed the sharing conditions for ESIM with terrestrial services in the band 27.5-29.5 GHz and concluded that ESIM transmitters could interfere with terrestrial service receivers. Therefore, aeronautical and maritime ESIM must operate under specific technical, operational and regulatory conditions to avoid causing unacceptable interference to receiving stations of terrestrial services and, likewise, land ESIM need to operate under the condition of not causing unacceptable interference to receiving stations of terrestrial services operating in accordance with the RR.

Results of sharing studies with the Earth Exploration Satellite Service (EESS) (passive)

The ITU-R examined sharing conditions for ESIM with the EESS (passive) in the 18.6-18.8 GHz band used by the EESS (passive) in remote sensing for Earth exploration, in which the EESS (passive) earth station and the ESIM are receiving. Therefore, ESIM receivers can cause no interference with the SETS receiver (passive).

The ITU-R noted that the use of ESIM in the band 27.5-29.5 GHz would not change the current interference environment with respect to the secondary service EESS in the range 28.5-29.5 GHz.

Results of sharing studies with the meteorological satellite service

The ITU-R examined sharing conditions for ESIM receivers and the meteorological-satellite service in the 18 GHz range. The satellite meteorological earth station and the ESIM are receiving in this band. Therefore, ESIM receivers cannot cause interference with the receiving station of the meteorological satellite.

Results of sharing studies with the FSS

The ITU-R reviewed the sharing conditions between the ESIM and the GSO FSS satellite systems in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz. As a result, it found that ESIM operations need to be maintained within the envelope of the satellite network with which they communicate, and concluded that to prevent interference between ESIMs and the GSO systems of the SFS of other administrations, the provisions of the proposed Resolution must be followed.

On the other hand, in the bands 17.7-18.6 GHz and 18.8-19.3 GHz, interference from ESIMs with earth stations communicating with non-GSO FSS systems is not anticipated, since both are in the receiving direction (space-to-Earth).

Regarding interferences that ESIM could receive, in the 17.7-18.6 GHz band ESIMs will not claim protection from non-GSO systems, but will accept the levels of protection from non-GSO FSS systems that comply with those established within the pfd limits of Article 22 and, for the band 18.8-19.3 GHz, will operate under the technical and operating parameters contained in the respective coordination agreement in application of RR Nos. 9.12A and 9.13, so ESIM would not require any additional protection.

For the frequency segments 27.5-28.6 GHz and 28.6-29.1 GHz, it was found that the ESIM transmission link could potentially interfere with non-GSO system receivers, and it is proposed that the ESIM protect non-GSO systems as set out in the proposed resolution.

Results of sharing studies with the BSS

ESIM terminals are receiving and BSS feeder link earth stations transmitting in the 17.7-18.1 and 18.1-18.4 GHz bands. Therefore, ESIM should not claim protection or impose restrictions on the development of BSS earth stations.

With respect to the band 27.5-29.5 GHz, ESIMs must remain within the envelope of the satellite network with which they communicate, and it is necessary to indicate this in a proposed resolution contained in the draft text of the CPM.

**DRAFT INTER-AMERICAN PROPOSALS**

ARTICLE 5

Frequency allocations

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

Support:

**CAN, [GTM], MEX, [URG], USA**

MOD DIAP1.5/1

15.4-18.4 GHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 17.7-18.1  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A ADD 5.A15 (Earth-to-space) 5.516  MOBILE | 17.7-17.8  FIXED  FIXED-SATELLITE (space-to-Earth) 5.517 ADD 5.A15 (Earth-to-space) 5.516  BROADCASTING-SATELLITE  Mobile  5.515 | 17.7-18.1  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A ADD 5.A15 (Earth-to-space) 5.516  MOBILE |
|  | 17.8-18.1  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A ADD 5.A15 (Earth-to-space) 5.516  MOBILE  5.519 |  |
| 18.1-18.4 FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B ADD 5.A15  (Earth-to-space) 5.520  MOBILEA  5.519 5.521 | | |

Support:

**CAN, [GTM], MEX, [URG], USA**

MOD DIAP 1.5/2

18.4-22 GHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 18.4-18.6 FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B ADD 5.A15  MOBILE | | |
| 18.6-18.8  EARTH EXPLORATION-SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.522B ADD 5.A15  MOBILE except aeronautical mobile  Space research (passive) | 18.6-18.8  EARTH EXPLORATION- SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B ADD 5.A15  MOBILE except aeronautical mobile  SPACE RESEARCH (passive) | 18.6-18.8  EARTH EXPLORATION-SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.522B ADD 5.A15  MOBILE except aeronautical mobile  Space research (passive) |
| 5.522A 5.522C | 5.522A | 5.522A |
| 18.8-19.3 FIXED  FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A ADD 5.A15  MOBILE | | |
| 19.3-19.7 FIXED  FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E ADD 5.A15  MOBILE | | |

Support:

**CAN, [GTM], MEX, [URG], USA**

MOD DIAP 1.5/3

24.75-29.9 GHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 27.5-28.5 FIXED 5.537A  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 ADD 5.A15  MOBILE  5.538 5.540 | | |
| 28.5-29.1 FIXED  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 ADD 5.A15  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540 | | |
| 29.1-29.5 FIXED  FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A  5.539 5.541A ADD 5.A15  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540 | | |

Support:

**CAN, [GTM], MEX, [URG], USA**

ADD DIAP 1.5/4

**5.A15** The operation of earth stations in motion communicating with geostationary FSS space stations in the bands 17.7-19.7 GHz and 27.5-29.5 GHz , or portions thereof, shall be subject to draft new Resolution **[A15] (WRC-19)**.

**Reasons:** The objective of this footnote is to make draft new Resolution **[A15] (WRC-19)** mandatory.

***Reasons****: Adoption of this proposal would provide for the availability of an additional 2 GHz spectrum in each of the 30/20 GHz uplink and downlink directions of the FSS to support the large and growing global demand for broadband communications by users on ships, aircraft and land vehicles, on an equal basis in the three Regions and result in rational, efficient use of radio spectrum resources.*

Support:

**CAN, [GTM], MEX, [URG], USA**

ADD DIAP 1.5/5

draft new RESOLUTION [AI1.5] (WRC-19)

Use of the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz by earth stations in motion (ESIM) communicating with geostationary space stations  
in the fixed-satellite service

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

considering

*a)* that there is a need for global broadband mobile-satellite communications, and that some of this need could be met by allowing earth stations in motion (ESIM) to communicate with space stations of geostationary-satellite orbit (GSO) fixed-satellite service (FSS) operating in the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space);

*b)* that appropriate regulatory and interference management mechanisms are necessary for the operation of ESIM;

*c)* that the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) are also allocated to terrestrial and space services used by a variety of different systems and these existing services and their future development need to be protected from the operation of ESIM,

recognizing

*a)* that the administration authorizing ESIM on territory under its jurisdiction has the right to require that ESIM referred to above only use those assignments associated with GSO FSS networks which have been successfully coordinated, notified, brought into use and recorded in the MIFR with a favourable finding under Article **11**, including Nos. **11.31**, **11.32** or **11.32A**, where applicable;

*b)* that for cases of incomplete coordination under No. **9.7** of the GSO FSS network with assignments to be used by ESIM, the operation of ESIM using those assignments in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz needs to be in accordance with the provisions of No. **11.42** with respect to any recorded frequency assignment which was the basis of the unfavourable finding under No. **11.38**;

*c)* that any course of action taken under this Resolution has no impact on the original date of receipt of the frequency assignments of the GSO FSS satellite network with which ESIM communicate or on the coordination requirements of that satellite network;

*d)* that the operation of any type of ESIM (land, maritime and aeronautical) within the territory(-ies), territorial waters and airspace under the jurisdiction of an administration, shall be carried out only if authorized by that administration,

Resolves

1 that for any ESIM communicating with a GSO FSS space station in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz, or portions thereof, the following conditions shall apply:

1.1 with respect to space services in the 17.7-19.7 GHz and 27.5-29.5 GHz frequency bands, ESIM shall comply with the following conditions:

1.1.1 with respect to satellite networks or systems of other administrations, the ESIM characteristics shall remain within the envelope of the satellite network with which these ESIM communicate;

1.1.2 that the notifying administration of the GSO FSS network, with which ESIM communicate, shall ensure that ESIM operation complies with coordination agreements for the frequency assignments of this GSO FSS network under the relevant provisions of the Radio Regulations;

1.1*.*3 for the implementation of *resolves*1.1.1 above, the notifying administration of the GSO FSS network with which ESIM communicate shall send to the Bureau under this Resolutionthe relevant Appendix **4** information related to the characteristics of the ESIM intended to communicate with the space station of that GSO FSS network, together with the commitment that the ESIM operation shall be in conformity with the Radio Regulations and this Resolution;

1.1.4 upon receipt of the information provided in accordance with *resolves*1.1.3 above, the Bureau shall examine it in relation to the requirements referred to in *resolves*1.1.1 based on the complete information submitted. If, following this examination, the Bureau concludes that the ESIM characteristics are within the envelope of the satellite network, the Bureau shall publish the results for information in the BR IFIC, otherwise the information shall be returned to the notifying administration;

1.1.5 should the Bureau find, prior to entering the characteristics for a network into the MIFR, that the information submitted under *resolves* 1.1.3 is not in compliance with the requirements of *resolves* 1.1.1, the corresponding information previously published by the Bureau under *resolves* 1.1.4 shall be suppressed;

1.1.6 for the protection of non-GSO FSS systems operating in the frequency band 27.5-[28.6/29.1] GHz, ESIM communicating with GSO FSS networks shall comply with the provisions contained in Annex 1 to this Resolution;

1.1.7 for the protection of non-GSO MSS feeder links operating in the frequency band 29.1-29.5 GHz, ESIM communicating with GSO FSS networks Annex 1*bis* to this Resolution applies;

1.1.8 ESIM shall not claim protection from non-GSO FSS systems operating in the frequency band 17.8-18.6 GHz in accordance with the Radio Regulations, including No. **22.5C**;

1.1.9 ESIM shall not claim protection from BSS feeder link earth stations operating in the frequency band 17.7-18.4 GHz in accordance with the Radio Regulations;

1.2 with respect to terrestrial services in the 17.7-19.7 GHz and 27.5-29.5 GHz frequency bands ESIM shall comply with the following conditions:

1.2.1 the receiving ESIM in the 17.7-19.7 GHz frequency band shall not claim protection from terrestrial services in the above-mentioned frequency band operating in accordance with the Radio Regulations;

1.2.2 the transmitting aeronautical and maritime ESIM in the 27.5-29.5 GHz frequency band shall not cause unacceptable interference to terrestrial services in the above-mentioned frequency band operating in accordance with the Radio Regulations and Annex 2 applies;

1.2.3 the transmitting land ESIM in the 27.5-29.5 GHz frequency band shall not cause unacceptable interference to terrestrial services in neighbouring countries in the above-mentioned frequency band operating in accordance with the Radio Regulations;

1.2.4 for the implementation of *resolves* 1.2.2 and 1.2.3 above, the notifying administration responsible for the GSO FSS satellite network with which ESIM communicate shall submit to the Bureau together with the Appendix **4** data referred to in *resolves* 1.1.3 a commitment undertaking that in case of unacceptable interference, upon receipt of a report of interference, take necessary action to immediately eliminate this interference or reduce interference to an acceptable level

1.2.5 that for the protection of terrestrial services operating in the frequency band 27.5- 29.5 GHz, the aeronautical and maritime ESIM shall comply with the provisions contained in Annex 2 of this Resolution;

2 that ESIM shall not be relied upon for safety-of-life applications;

3 that the administration responsible for the GSO FSS satellite network with which the ESIM communicate shall ensure that:

3.1 techniques to maintain pointing accuracy with the associated GSO FSS satellite, without inadvertently tracking adjacent GSO satellites, are employed for the operation of ESIM;

3.2 all necessary measures are taken so that ESIM are subject to permanent monitoring and control by a Network Control and Monitoring Centre (NCMC) or equivalent facility and are capable of receiving and acting upon at least “enable transmission” and “disable transmission” commands from the NCMC or equivalent;

3.3 measures, when required, are taken to limit the operation of ESIM to the territory or territories under the jurisdiction of the administrations authorizing ESIM;

3.4 a point of contact is provided for the purpose of tracing any suspected cases of unacceptable interference from ESIM;

4 that in case of unacceptable interference caused by any type of ESIM:

4.1 the administration of the country in which the ESIM is authorized shall cooperate with an investigation into the matter to provide any available information on the operation of ESIM and a point of contact to provide such information;

4.2 the administration of the country in which the ESIM is authorized and the notifying administration of the satellite network with which the ESIM communicate shall, jointly or individually, as the case may be, upon receipt of a report of interference, take required action to eliminate or reduce interference to an acceptable level;

5 that the application of this Resolution does not provide regulatory status to ESIM different from that derived from the GSO FSS network with which they communicate taking into account the provisions referred to in this Resolution,

instructs the Director of the Radiocommunication Bureau

1 to take any necessary actions for the implementation of this Resolution;

2 to take any necessary actions to facilitate the implementation of this Resolution, including assisting in resolving interference, if any;

invites administrations

to collaborate, to the maximum extent practicable, for the implementation of this Resolution, in particular for resolving interference, if any;

instructs the Secretary-General

to bring this Resolution to the attention of the Secretary-General of the International Maritime Organization (IMO) and of the Secretary General of the International Civil Aviation Organization (ICAO).

Annex 1 to draft new Resolution [AI1.5] (WRC-19)

Provisions for ESIM to protect space services in the frequency band 27.5-29.5 GHz

1 In order to protect those non-GSO FSS systems referred to in *resolves*1.1.6 of this Resolution, ESIM shall comply with the following provisions:

*a)* the level of equivalent isotropically radiated power (e.i.r.p.) density emitted by an ESIM in a geostationary-satellite network in the 27.5-[28.6/29.1] GHz frequency band shall not exceed the following values for any off-axis angle ϕ which is 3° or more off the main-lobe axis of an ESIM antenna and outside 3° of the GSO:

|  |  |  |
| --- | --- | --- |
| *Off-axis angle* |  | *Maximum e.i.r.p. density* |
| 3    7 |  | 28 – 25 log dB(W/40 kHz) |
| 7    9.2 |  | 7 dB(W/40 kHz) |
| 9.2    48 |  | 31 – 25 log dB(W/40 kHz) |
| 48    180 |  | −1 dB(W/40 kHz) |

*b)* for any ESIM that does not meet the condition *a)* above, outside of 3° of the GSO arc, the maximum ESIM on-axis e.i.r.p. shall not exceed 55 dBW for emission bandwidths up to and including 100 MHz. For emission bandwidths larger than 100 MHz, the maximum ESIM on‑axis e.i.r.p. may be increased proportionately;

Annex 1*bis* to draft new Resolution [A15] (WRC-19)

Provisions for protection of non-GSO MSS feeder links in the frequency band 29.1‑29.5 GHz from ESIM

With regard to non-GSO MSS feeder links referred to in *resolves* 1.1.7 of this Resolution, the provisions in Part A, Part B, or Part C, below, as appropriate, shall apply:

A. If an ESIM communicating with a GSO FSS network complies with each of the parameters or operating conditions listed in Table 1 below, coordination is used to ensure compatibility between the affected non-GSO MSS feeder link systems in the 29.1-29.5 GHz band and the GSO FSS network with which the ESIM is associated.

Table 1

ESIM operational characteristics and parameter

|  |  |
| --- | --- |
| E.i.r.p density per carrier (single per ESIM) | ≤35.5 dBW/MHz |
| Off-axis e.i.r.p density | per RR No. 22.32 |
| Average carrier burst duty cycle | ≤ 10% (averaged over 30 seconds) |
| Number of transmitting ESIM in a single satellite beam in a 15 MHz channel | ≤6 |

B. If an ESIM communicating with a GSO FSS network does not comply with each of the parameters or operating conditions listed in Table 1 above, but complies with each of the parameters of operating conditions listed in Table 2 below, coordination is used to ensure compatibility between the affected non-GSO MSS feeder link systems in the 29.1-29.5 GHz band and the GSO FSS network with which the ESIM is associated. However, depending on the values of these parameters and characteristics in combination, there needs to be an exclusion zone or other constraint(s) on ESIM developed by the parties and included in the agreement. Until such time as an agreement on coordination is reached, ESIM shall not operate within 500 km of a non-GSO MSS feeder link earth station in any portion of the 29.1-29.5 GHz band used by non-GSO MSS feeder links earth station, and ESIM shall operate pursuant to No. 4.4.

Table 2

ESIM operational characteristics and parameter

|  |  |
| --- | --- |
| E.i.r.p density per carrier (single per ESIM) | ≤50 dBW/MHz |
| Off-axis e.i.r.p density | per RR No. 22.32 |
| Average carrier burst duty cycle | 100% (averaged over 4 hours) |
| Number of transmitting ESIM in a single satellite beam in a 15 MHz channel | ≤12 |

C. If an ESIM communicating with a GSO FSS network does not comply with each of the parameters or operating conditions listed in Table 1 or Table 2 above, the ESIM shall not operate within 725 km of the non-GSO MSS feeder link earth station in any portion of the 29.1-29.5 GHz band used by non-GSO MSS feeder link earth stations, and any ESIM operations between 725 and 1,450 km of the non-GSO MSS feeder link earth station in any portion of the 29.1-29.5 GHz band used by non-GSO MSS feeder link earth stations shall operate pursuant to No. 4.4.

Annex 2 to draft new Resolution [AI1.5] (WRC-19)

Provisions for maritime and aeronautical ESIM to protect terrestrial services in the frequency band 27.5-29.5 GHz

Part 1: MARITIME ESIM

1 The notifying administration of the GSO FSS satellite network with which a maritime ESIM communicates shall ensure compliance of the maritime ESIM with the following conditions:

1.1 the minimum distances from the low-water mark as officially recognized by the coastal State beyond which maritime ESIM can operate without the prior agreement of any administration is 70 km in the 27.5-29.5 GHz frequency band. Any transmissions from maritime ESIM within the minimum distance shall be subject to the prior agreement of the concerned coastal State;

1.2 the maximum maritime ESIM e.i.r.p. spectral density towards the horizon shall be limited to 12.98 dB(W/1 MHz). Transmissions from maritime ESIM with higher e.i.r.p. spectral density levels towards the territory of any coastal state shall be subject to the prior agreement of the concerned coastal State together with the mechanism by which this level is to be maintained.

Part 2: AERONAUTICAL ESIM

The part below is intended as provisions for aeronautical ESIM to protect terrestrial services operating in the frequency band 27.5-29.5 GHz for the implementation of *resolves* 1.2.2.

2 The notifying administration of the GSO FSS satellite network with which an aeronautical ESIM communicates shall ensure compliance of the aeronautical ESIM with the following conditions:

2.1 That within the territory under the jurisdiction of an administration where the aeronautical ESIM operates, it shall not transmit in frequency bands authorized by that administration for fixed service and/or mobile service operation unless explicit agreement of the affected administration is provided;

2.2 that for the purpose of protecting fixed and mobile service stations in other administrations from interference, from a single aeronautical ESIM shall not exceed the following maximum power flux-density values at the Earth’s surface at an administration’s border, unless explicit agreement of the affected administration is provided:

PFD(δ) = -122.7 (dBW/m2/1 MHz) for 0° ≤ δ ≤ 2°

PFD(δ) = -122.6 + 1.5 \* (δ - 2) (dBW/m2/1 MHz) for 2° < δ ≤ 13.6°

PFD(δ) = -105.2 (dBW/m2/1 MHz) for 13.6° < δ ≤ 90°

where δ is the angle of arrival of the radio-frequency wave (degrees above the horizon).

2.3 The maximum power of unwanted emissions in the out-of-band domain should be attenuated below the maximum output power of the aeronautical ESIM transmitter as described in Recommendation ITU-R SM.1541.

3 Within the territory under the jurisdiction of an administration where the ESIM operate, aeronautical ESIM shall comply with the bilateral or multilateral agreements of the concerned administrations.

Support:

**CAN, [GTM], MEX, [URG], USA**

**MOD DIAP /1.5/6**

Note: Further work on the possible changes to Appendix 4 is necessary.

APPENDIX 4 (REV.WRC‑15)

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 stations2     (Rev.WRC‑12)

Footnotes to Tables A, B, C and D

**TABLE A**

GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,   
EARTH STATION OR RADIO ASTRONOMY STATION     (Rev.WRC‑19)

| 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.18** | **COMPLIANCE WITH NOTIFICATION OF AIRCRAFT EARTH STATION(S)** |  | | | | | | | | | **A.18** |  |
| A.18.a | a commitment that the characteristics of the aircraft earth station (AES) in the aeronautical mobile-satellite service are within the characteristics of the specific and/or typical earth station published by the Bureau for the space station to which the AES is associated  Required only for the band 14-14.5 GHz, when an aircraft earth station in the aeronautical mobile-satellite service communicates with a space station in the fixed-satellite service |  |  |  | **+** | **+** |  |  |  |  | A.18.a |  |
| **A.19** | **COMPLIANCE WITH § 6.26 OF ARTICLE 6 OF APPENDIX 30B** |  |  |  |  |  |  |  |  |  | **A.19** |  |
| A.19.a | a commitment that the use of the assignment shall not cause unacceptable interference to, nor claim protection from, those assignments for which agreement still needs to be obtained  Required if the notice is submitted under § 6.25 of Article 6 of Appendix **30B** |  |  |  |  |  |  |  |  | **+** | A.19.a |  |
| **A.20** | **COMPLIANCE WITH r*esolves*** **1.1.2 OF DRAFT NEW RESOLUTION [A15] (WRC‑19)** |  |  |  |  |  |  |  |  |  | **A.20** |  |
| A.20.a | indicator (yes) if an assignment for the 27.5‑29.5 GHz and/or 17.7-19.7 GHz band in the satellite network will be used by ESIM |  |  |  |  |  | **O** |  |  |  | A.20.a |  |
| A.20.b | if yes under A.20.a, a commitment that the ESIM operation would be in conformity with the Radio Regulations and draft new Resolution **[A15] (WRC‑19)** (including its Annexes) |  |  |  |  |  | **+** |  |  |  | A.20.b |  |

Support:

**CAN, MEX, [URG], USA**

SUP DIAP 1.5/7

RESOLUTION 158 (WRC‑15)

Use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with  
geostationary space stations in the fixed-satellite service