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| A close up of a sign  Description automatically generated | **World Radiocommunication Conference (WRC-23)Dubai, 20 November - 15 December 2023** |  |
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| PLENARY MEETING | **Addendum 15 toDocument 44-E** |
|  | **13 October 2023** |
|  | **Original: English** |
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| Member States of the Inter-American Telecommunication Commission (CITEL) |
| PROPOSALS FOR THE WORK OF THE CONFERENCE |
|  |
| Agenda item 1.15 |

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)**;

Background

The demand for mobile connectivity services provided by earth stations on aircraft and ships continues to grow as the importance of and access to Internet-based applications for the aviation and maritime industry, as well as for their passengers, increases. Given this reality, WRC-19 adopted agenda item 1.15 for WRC-23 to study the operation of earth stations on board aircraft and ships communicating with space stations in the geostationary fixed-satellite service (FSS) and potential sharing and compatibility issues with traditional services in the frequency band 12.75‑13.25 GHz and primary services in adjacent frequency bands. The use of the frequency band 12.75‑13.25 GHz by the GSO FSS (Earth-to-space) is subject to RR Appendix **30B**.

Previous WRCs have adopted technical and regulatory provisions to allow aeronautical and maritime terminals to communicate with GSO FSS networks in other frequency bands:

1 Resolution **902 (WRC-03)** addresses the use of shipborne earth stations communicating with GSO FSS networks in the frequency bands 5 925-6 425 MHz and 14-14.5 GHz (RR No. **5.457A**);

2 Resolution **156 (WRC-15)** addresses the use of earth stations in motion (ESIM) communicating with GSO FSS networks in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz (RR No. **5.527A**);

3 Resolution **169 (WRC-19)** addresses the use of ESIMs that communicate with GSO FSS networks in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz (RR No. **5.517A**).

According to the outcome of the studies being carried out in ITU-R regarding WRC-23 agenda item 1.15, this proposal supports Method B of the CPM Report, to meet WRC-23 agenda item 1.15, which consists of establishing a new regulatory framework and new operational requirements for earth stations on board aircraft and ships in the frequency band 12.75-13.25 GHz (Earth-to-space). The outcome of the ITU-R studies ensures the protection of the services allocated to the frequency band under study, as well as the services in adjacent frequency bands, in accordance with Resolution **172 (WRC-19)**. These studies cover the protection of geostationary networks operating under the RR Appendix **30B** FSS, non-geostationary FSS systems, the Earth exploration-satellite service, the aeronautical radionavigation service, and the fixed and mobile terrestrial services. The annexes of the proposed Resolution include procedures and technical limits that ensure protection of these services.

Proposals

ARTICLE 5

Frequency allocations

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

MOD IAP/44A15/1#1874

11.7-13.4 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 12.75-13.25 FIXED FIXED-SATELLITE (Earth-to-space) 5.441 ADD 5.A115 MOBILE Space research (deep space) (space-to-Earth) |

ADD IAP/44A15/2#1875

5.A115The operation of earth stations in motion on board 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) shall be subject to the application of Resolution **[IAP-A115] (WRC‑23)**.     (WRC‑23)

ADD IAP/44A15/3#1876

DRAFT new RESOLUTION [IAP-A115] (WRC‑23)

Use of the frequency band 12.75-13.25 GHz by earth stations in motion on aircraft and vessels communicating with geostationary space stations in the fixed-satellite service

The World Radiocommunication Conference (Dubai, 2023),

considering

*a)* that WARC Orb‑88 established 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 objective of providing broadband mobile satellite communications may also be met by allowing earth stations in motion (ESIMs), on aircraft (A‑ESIMs) and vessels (M‑ESIMs), to communicate with the geostationary space stations of a fixed-satellite service network in the frequency bands 12.75-13.25 GHz (Earth-to-space) and the associated downlink frequency bands of that satellite, thus for example the frequency bands 10.70-10.95 GHz and 11.20-11.45 GHz of Appendix **30B** may be used;

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

*e)* that the operation of services to which the frequency band 12.75-13.25 GHz is allocated and those in adjacent bands needs to be protected from A‑ESIM and M‑ESIM;

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

*g)* that the objective of the procedures in Appendix **30B** is to guarantee, for all countries, equitable access to the GSO in the frequency bands of the FSS covered by this Appendix;

*h)* that appropriate regulatory and interference-management mechanisms, including necessary mitigation measures and associated techniques, are required for the operation of A‑ESIM and M‑ESIM in the frequency band 12.75-13.25 GHz (Earth-to-space) to protect other space and terrestrial services in this frequency band as well as services in adjacent frequency bands and without adversely affecting those services and their future development, taking into account the provisions of Appendix **30B** (see also *resolves further*1 to 5 on responsibilities);

*i)* that, in Appendix **30B**, the frequency bands in the space-to-Earth direction corresponding to the frequency band 12.75-13.25 GHz (Earth-to-space) are 10.7-10.95 GHz and 11.2-11.45 GHz, which may be used by A‑ESIM and M‑ESIM, subject to not claiming protection from other services and applications of the FSS and other radiocommunication services to which the frequency band is allocated;

*j)* that there is no publicly available information on coordination agreements reached among administrations regarding GSO FSS satellite networks except whether coordination has been completed, which is provided to, and published by, the Radiocommunication Bureau (BR);

*k)* that the operation of A‑ESIM and M‑ESIM requires the establishment of one or more gateway earth station facilities in one or several countries that are within the service area of the associated satellite network and that are authorized by the administration of the territory where such earth stations are located,

considering further

*a)* that A‑ESIMs and M‑ESIMs operating within the agreed service area of the satellite network with which they communicate may provide service within the territories under the jurisdiction of multiple administrations;

*b)*that the operation of ESIMs within the territory under the jurisdiction of administrations/countries mentioned in *considering further a)* above is subject to obtaining authorization from those administrations,

recognizing

a)that Article 44 of the ITU Constitution contains 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;

*b)* that administrations intending to authorize A‑ESIMs and M‑ESIMs, when establishing national licensing rules, may consider adopting other interference management procedures and/or mitigation measures than those contained in this Resolution;

*c)* that, pursuant to the relevant paragraph in Appendix **30B**, the operation of ESIM in the frequency band 12.75-13.25 GHz could be only within the service area of the Appendix **30B** network for which the explicit agreement of any administration whose territory is partially or wholly included in this service area has been obtained;

*c bis)* that § 6.16 of Article 6 of Appendix **30B** provides the opportunity to any administration at any time to request that its territory be excluded from the service area of any assignment governed by Appendix **30B**, therefore the service area can change;

*d)* that the operation of an A‑ESIM and M‑ESIM pertaining to and communicating with a space station of a given satellite network needs that earth station to be within the coordinated and agreed service area of that satellite under the relevant provisions of Appendix **30B**;

*e)* that, based on the available information in the Bureau’s database in May 2022, there is no contiguous regional or worldwide coordinated and agreed service area for any satellite using the Appendix **30B** frequency band 12.75-13.25 GHz recorded in the Master International Frequency Register (MIFR);

*f)* that, in order for A‑ESIM and M‑ESIM to operate in the frequency band 12.75-13.25 GHz (Earth-to-space) of Appendix **30B** in the most efficient and operationally viable manner, having a contiguous regional or worldwide coordinated and agreed service area is an important issue to be taken into account;

*g)* that the administration authorizing ESIMs on the territory under its jurisdiction has the right to require that the ESIMs 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 § 8.11 of Article 8 of Appendix **30B**, except those arising from the application of § 6.25 of Appendix **30B**;

*h)* that Resolution **170 (WRC‑19)** provides the procedure to enhance equitable access to frequency bands under Appendix **30B** by developing countries;

*i)* that the protection of current usage and future development of Appendix **30B** in the frequency band 12.75-13.25 GHz (Earth-to-space) is a fundamental issue without any adverse effect thereto;

*j)* that the availability of the methodology to examine conformity to the power flux-density (pfd) limit as contained in Annex 2 to this Resolution is a fundamental and crucial element;

*k)* that there is need to establish regulatory, technical and recording procedures for the usage of these type of ESIMs that may differ from the current FSS Appendix **30B** Plan and List recording procedures;

*l)* that successful compliance with this Resolution does not oblige any administration to authorize/license A‑ESIM and M‑ESIM communicating with geostationary space stations in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space) to operate within the territory under its jurisdiction (see *resolves*7);

*m)* that, in accordance with Appendix **30B**, the examination of the Bureau in the frequency band 12.75-13.25 GHz (Earth-to-space) is limited to the test-points on land; it is necessary to perform the examination of A‑ESIM and M‑ESIM using grid points generated everywhere within the service area of A‑ESIM and M‑ESIM submitted under Appendix **4** (see Annex 1 to this Resolution),

recognizing further

*a)* that, under *resolves* 1.1.3 of this Resolution, frequency assignments to ESIMs need to be notified to the BR;

*b)* that, for the operation of ESIMs, notification of any frequency assignment under Annex 1 of this Resolution shall only be made by one single administration which is the notifying administration of the GSO FSS network with which ESIMs communicate;

*c)* that an administration authorizing the operation of ESIMs within the territory under its jurisdiction may modify and/or withdraw that authorization at any time;

*d)* that the three elements consisting of interference management mechanism, switching facility for on/off function and the function of NCMC and their relations with each other and sequence of actions together with estimated time for that action/function are needed for the proper and factual operation of the ESIM;

*e)* the operation of A‑ESIM and M‑ESIM shall comply with provision No. **5.340**;

*f)* when the Appendix **30B** GSO FSS satellite network with which A‑ESIM and M‑ESIM communicate transmits in the frequency bands 10.7-10.95 GHz and 11.2-11.45 GHz, it shall operate under the levels that were coordinated and included in the List, and these Appendix **30B** satellite transmissions will not change to accommodate A‑ESIM and M‑ESIM;

*g)* the operation of A‑ESIM and M‑ESIM in the frequency bands 10.7-10.95 GHz and 11.2-11.45 GHz, if any, shall not adversely affect the allotments in the Plan or the assignments in the List and not claim protection from other applications of the FSS as well as other radiocommunication services to which the frequency band is allocated,

resolves

1that, for any A‑ESIM and M‑ESIM communicating with a GSO FSS space station within the frequency band 12.75-13.25 GHz (Earth-to-space) or parts thereof, the following conditions shall apply:

1.1with respect to space services in the frequency band 12.75-13.25 GHz and adjacent bands, A‑ESIM and M‑ESIM shall comply with the following conditions:

1.1.1 the use of the frequency band 12.75-13.25 GHz (Earth-to-space) by A‑ESIM and M‑ESIM shall not result in any changes or restrictions to the allotment in the Plan, assignments in the List of Appendix **30B**, and those recorded in the MIFR, including the assignments arising from the implementation of Resolution **170 (WRC‑19)**;

1.1.2 with respect to satellite networks or systems of other administrations, the characteristics of A‑ESIM and M‑ESIM shall remain within the envelope of typical characteristics of notified earth stations associated with the satellite networks with which these earth stations communicate, as published by the Bureau and included in relevant International Frequency Information Circular (BR IFIC), and Annex 1 applies;

1.1.2*bis* the use of A‑ESIM and M‑ESIM shall not cause any interference to Appendix **30B** allotments, assignments received by the Bureau under Article 6 either in process or yet to be processed, assignments in the List, assignments notified under Article 8 of that Appendix, and assignments recorded in the MIFR as well as submission under Appendix **30B** beyond that specified in the relevant Annexes to that Appendix;

1.1.3 for the implementation of *resolves*1.1.1, 1.1.2 and 1.1.2*bis* above, the notifying administration for the GSO FSS network with which the above-mentioned A‑ESIM and M‑ESIM communicate shall follow the procedure in Annex 1 of this Resolution, together with the commitment that the operation of ESIM shall be in conformity with the Radio Regulations, including this Resolution;

1.1.4 upon receipt of the notification information referred to in *resolves*1.1.3 above, the BR shall process the submission in accordance with Annex 1 of this Resolution;

1.1.5 for the protection of non-GSO FSS systems operating in the frequency band 12.75-13.25 GHz, the above-mentioned A-ESIM and M-ESIM communicating with GSO FSS networks referred to above shall comply with the provisions contained in Annex 3 of this Resolution;

1.1.6 the notifying administration of the GSO FSS network with which the above-mentioned earth stations communicate shall ensure that the operation of these A‑ESIM and M‑ESIM complies with the coordination agreements for the frequency assignments of the earth station of this GSO FSS satellite network of Appendix **30B** obtained under the relevant provisions of that Appendix;

1.2 with respect to the protection of terrestrial services to which the frequency band 12.75-13.25 GHz is allocated and that operate in accordance with the Radio Regulations, A‑ESIM and M‑ESIM shall comply with the following conditions:

1.2.1 transmitting A‑ESIM and M‑ESIM in the frequency band 12.75-13.25 GHz (Earth-to-space) shall not cause unacceptable interference to terrestrial services to which this frequency band is allocated and that operate in accordance with the Radio Regulations, and Annex 2 to this Resolution shall apply;

1.2.2 the receiving part of the above-mentioned ESIM in their associated frequency band shall not claim protection from terrestrial services to which this frequency band is allocated and that operate in accordance with the Radio Regulations;

1.2.3 the requirement to not cause unacceptable interference to terrestrial services to which the frequency band 12.75-13.25 GHz is allocated and that operate in accordance with the Radio Regulations shall be respected, irrespective of compliance with Annex 2 (see *resolves*7);

1.2.4 for the application of Part II of Annex 2 as referred to in *resolves*1.2.1 above, the BR shall examine the characteristics of A‑ESIM with respect to the conformity with the pfd limits on the Earth’s surface specified in Part II of Annex 2, and publish the results of such examination in the BR IFIC;

1.2.5 the compliance with the technical conditions in Annex 2 does not release the notifying administration of the A‑ESIM and M‑ESIM with respect to discharging its responsibility that such earth stations shall not cause unacceptable interference and any interrelated receiving part shall not claim protection from the terrestrial stations;

1.2.6 if the BR is unable to examine, in accordance with *resolves*1.2.4 above, the A‑ESIM with respect to conformity with the pfd limits on the Earth’s surface specified in Part II of Annex 2, the notifying administration shall send to BR a commitment that the A‑ESIM shall comply with those limits;

1.2.7 the BR shall formulate a qualified favourable finding with respect to the limits contained in Part II of Annex 2 if *resolves*1.2.6 is applied successfully, otherwise it shall formulate an unfavourable finding;

1.2.7*bis* that, after the successful application of *resolves*1.2.6 and 1.2.7, once the methodology to examine the characteristics of aeronautical GSO ESIMs with respect to conformity with the pfd limits on the Earth’s surface specified in Part II of Annex 2 is available, *resolves*1.2.4 shall be applied by the Bureau;

1.2.8 if administrations authorizing A‑ESIM agree to pfd levels higher than the limits contained in Part II of Annex 2 within the territory under its jurisdiction, such agreement shall in no way affect other countries that are not party to that agreement;

1.2.9 M‑ESIM will communicate, taking into account the *resolves further* below, shall send to the BR, together with submission of the Appendix **4** information for the above-mentioned earth station, a commitment undertaking that, upon receiving a report of unacceptable interference, it shall immediately take all appropriate measures to eliminate that interference or reduce it to an acceptable level and follow the procedures in *resolves*9;

1.3 with respect to the aeronautical radionavigation systems operating in the frequency band 13.25-13.4 GHz, A‑ESIM and M‑ESIM communicating with GSO FSS networks shall not cause unacceptable interference to the aeronautical radionavigation service (ARNS) operating in accordance with the Radio Regulations in the 13.25-13.40 GHz band;

2 that only frequency assignments of Appendix **30B** recorded in the List can be used as supporting assignments by A‑ESIMs and M‑ESIMs communicating with GSO networks in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space), if those assignments are recorded in the MIFR with a favourable finding under § 8.11 of Article 8 of Appendix **30B** provided that assignments recorded under § 6.25 of Article 6 used for A‑ESIM and M‑ESIM operations shall not cause unacceptable interference or claim protection from those assignments for which agreement was not obtained;

3 that operation of A‑ESIM and M‑ESIM communicating with GSO space stations in the FSS in the frequency band 12.75-13.25 GHz (Earth-to-space) shall be within the coordinated and notified service area of the GSO FSS network with which the earth stations communicate;

4 that, for the implementation of *resolves*3 above, the notifying administration for the GSO FSS network with which the A‑ESIM and M‑ESIM communicate shall ensure that necessary arrangements and switching facilities are built into the above-mentioned earth stations to cease emissions once approaching the territory under the jurisdiction of those administrations which either are not within the notified and coordinated service area of the subject space station or have not authorized the operation over their territories;

5 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 A‑ESIM and M‑ESIM communicate, or on the coordination requirements of that satellite network;

6 that A‑ESIM and M‑ESIM shall not be used or relied upon for safety-of-life applications;

7 that the operation of A‑ESIM and M‑ESIM within territorial waters and/or airspace under the jurisdiction of an administration shall be carried out only if a licence according to No. **18.1** of the Radio Regulations/authorization of that administration is obtained;

8 that gateway earth station facilities for A‑ESIM and M‑ESIM shall be within the service area of the satellite network associated to that gateway;

9 that, in the case unacceptable interference caused by A‑ESIM and/or M‑ESIM is reported:

9.1 the administration of the country in which the ESIM(s) is authorized shall cooperate with an investigation on the matter and provide any required information on the operation of the ESIM(s) and a point of contact to provide such information;

9.2 the administration of the country in which the ESIM(s) is authorized and the notifying administration of the GSO FSS satellite network with which the A‑ESIM and M‑ESIM communicate shall, jointly or individually, as the case may be and to the extent of ability of the former administration, upon receipt of a report of unacceptable interference, take required actions to eliminate or reduce unacceptable interference to an acceptable level;

10 that the notifying administration of the GSO FSS satellite network with which the ESIM communicates shall ensure that:

10.1 for the operation of A‑ESIM and M‑ESIM, techniques are employed to maintain adequate pointing accuracy with the associated GSO FSS satellite;

10.2 all necessary measures shall be taken so that A‑ESIM and M‑ESIM are subject to permanent monitoring and control by a Network Control and Monitoring Centre (NCMC) or equivalent facility in order to comply with the provisions in this Resolution, and are capable of receiving and immediately acting upon, *inter alia*, “enable transmission” and “disable transmission” commands from the NCMC;

10.3 measures are taken so that the A‑ESIM and/or M‑ESIM do not transmit on the territory, under the jurisdiction of an administration, including its territorial waters and its national airspace, that is neither in the service area of the GSO satellite network and/or has not authorized its use on its territory;

10.4 a permanent point of contact shall be provided, in the Appendix **4** submission under Annex 1 of this Resolution and published in the special section, by the notifying administration of the GSO FSS network for the purpose of tracing any suspected cases of unacceptable interference from earth stations on aircraft and vessels and to immediately respond to such requests,

resolves further

1 that the notifying administration for the ESIMs shall send to the BR, when submitting the relevant Appendix **4** data, a commitment (as stipulated in *resolves*1.2.9) that, upon receiving a report of unacceptable interference, the notifying administration for the GSO satellite network with which ESIMs communicate shall immediately act to remove such interference or reduce the interference to an acceptable level;

2 that, in case of continued unacceptable interference despite of the commitment referred to in *resolves further*1, the assignment causing interference shall be submitted to the Radio Regulations Board for review;

3 that compliance with the provisions contained in Annex 2 does not release the notifying administration of the GSO satellite network with which ESIMs communicate of its obligations to ensure that ESIMs shall not cause unacceptable interference nor claim protection from other services referred to in this Resolution;

4 that frequency assignments in the frequency band 12.75-13.25 GHz (Earth-to-space) by A‑ESIM and M‑ESIM communicating with geostationary space stations in the FSS shall be notified by the notifying administration of the satellite network with which the ESIM communicates;

5 that ESIMs shall be designed and operate so as to cease transmission over the territory of any administration/country from which authorization has not been obtained,

instructs the Director of the Radiocommunication Bureau

1 to take all necessary actions to facilitate the implementation of this Resolution, together with providing any assistance for the resolution of interference, when required;

2 to report to future world radiocommunication conferences any difficulties or inconsistencies encountered in the implementation of this Resolution, including whether or not the responsibilities relating to the operation of A‑ESIMs and M‑ESIMs have been properly addressed;

3 to review, if necessary, once the methodology to examine the characteristics of A‑ESIMs with respect to conformity with the pfd limits on the Earth’s surface specified in Part II of Annex 2 is available,

instructs the Secretary-General

1 to bring this Resolution to the attention of the Council with a view to consider if cost recovery should be applied to ESIM;

2 to bring this Resolution to the attention of the Secretary-General of the International Maritime Organization and of the Secretary General of the International Civil Aviation Organization.

ANNEX 1 TO DRAFT NEW RESOLUTION [IAP-A115] (WRC‑23)

PART I

Procedure to be followed by the administrations and the Bureau for submission of the earth stations in motion on aircraft and vessels operating in the frequency band 12.75-13.25 GHz (Earth-to-space) and for the protection of allotments in the Plan, assignments in the Appendix 30B List and those submitted under Articles 6 and 7 of Appendix 30B as well as under Resolution 170 (WRC‑19)

Section A – Procedure for entering assignments to earth stations in motion on aircraft and vessels in the Appendix 30B ESIM List[[1]](#footnote-2)1

1 When an administration, or one acting on behalf of a group of named administrations, intends to use one or more Appendix **30B** assignments already included in the List and MIFR in support of the operation of A‑ESIMs and M‑ESIMs in the frequency band 12.75-13.25 GHz, it shall send to the Bureau, not earlier than eight years but preferably not later than two years before the operation of A-ESIMs and M-ESIMs, the information specified in Appendix **4**[[2]](#footnote-3)2.

An assignment in the Appendix **30B** ESIM List shall lapse if it is not brought into use within eight years of the date of receipt by the Bureau of the relevant complete information specified above. A proposed assignment not included in the Appendix **30B** ESIM List within eight years after the date of receipt by the Bureau of the relevant complete information shall also lapse.

1*bis* If the information received by the Bureau under § 1 is found to be incomplete, the Bureau shall immediately seek any clarification required and information not provided from the administration concerned.

2 Upon receipt of a complete notice under § 1, the Bureau shall examine it with respect to its conformity with:

*a)* the Table of Frequency Allocations and the other provisions[[3]](#footnote-4)3 of the Radio Regulations, except those provisions relating to conformity with the FSS Plan and the coordination procedures;

*b)* Annex 3 to Appendix **30B**;

*c)* the on-axis e.i.r.p. density and off-axis e.i.r.p. density of the supporting Appendix **30B** assignment(s);

*d)* the service area of the supporting Appendix **30B** assignment(s) in respect of explicit agreements of those administrations whose territories are included in the service area[[4]](#footnote-5)4;

*e)* the frequency band of the supporting Appendix **30B** assignment(s) in the List in the frequency band 12.75-13.25 GHz.

3 When the examination with respect to § 2 leads to an unfavourable finding, the relevant part of the notice shall be returned to the notifying administration with an indication of the appropriate action.

4 When the examination with respect to § 2 leads to a favourable finding, the Bureau shall use the method of Annex 4 to Appendix **30B** to determine administrations whose:

*a)* allotments in the Plan; or

*b)* assignments which appear in the List; or

*c)* assignments which the Bureau has previously examined under § 6.5 of Article 6 of Appendix **30B** after receiving complete information in accordance with § 6.1 of that Article, are considered as being affected and receiving more interference than that produced by the supporting Appendix **30B** assignment(s).

5 The Bureau shall publish, in a Special Section of its BR IFIC, the complete information received under § 1, together with the names of the affected administrations, the corresponding allotments in the Plan, assignments in the List and assignments for which the Bureau has previously received complete information in accordance with § 6.1 of Article 6 of Appendix **30B** and which it has examined under § 6.5 of that Article.

5*bis* The Bureau shall immediately inform the administration proposing the assignment, in the ESIM List drawing its attention to the information contained in the relevant BR IFIC and the requirement to seek and obtain the agreement of those affected administrations.

6 The Bureau shall also inform each administration listed in the Special Section of the BR IFIC published under § 5, drawing its attention to the information it contains.

7 An administration that has not notified its comments either to the administration seeking agreement or to the Bureau within a period of four months following the date of the BR IFIC referred to in § 5 shall be deemed to have not agreed to the proposed assignment in respect of its allotment in the Plan, conversion of an allotment into an assignment without modification or with a modification which is within the envelope characteristics of the initial allotment, Article 7 request transferred to Article 6, submission in accordance with Resolution **170 (WRC-19)**, according to the case for which absence of reply/comments shall construe their disagreement to the request for coordination. This time-limit shall be extended for an administration that has requested the assistance of the Bureau by up to 30 days following the date on which the Bureau communicated the result of its action. In respect of its frequency assignments under Article 6 of Appendix **30B** other than those mentioned above, the same course of action outlined in § 6.10 of that Article shall apply.

8 Unless coordination is no longer required, the administration responsible for the notice published under § 5 shall seek and obtain the explicit agreement of the relevant affected administrations contained in the Special Section published under § 5 in respect of allotment in the Plan, conversion of an allotment into an assignment without modification or with a modification which is within the envelope characteristics of the initial allotment, Article 7 request transferred to Article 6, submission in accordance with Resolution **170 (WRC-19)**, as appropriate. In this specific case of explicit agreement, any request for the assistance of the Bureau shall not change it to implicit/tacit agreement.

9 If agreements have been reached in accordance with §§ 7 and 8 with administrations published under § 5, the administration responsible for the notice published under § 5 may request the Bureau to have the assignment entered into the Appendix **30B** ESIM List, indicating the final characteristics of the notice[[5]](#footnote-6)5 together with the names of the administrations with which agreement has been reached.

9*bis* In submitting such information, noting the requirement of § 1 of Section B, the administration may also request the Bureau to examine the submission in respect of notification under Section B.

9*ter* If the information received by the Bureau under §§ 9 and 9*bis* is found to be incomplete, the Bureau shall immediately seek any clarification required and information not provided from the administration concerned. The Bureau may also provide additional information in order to assist the notifying administration in complying with requirements under §§ 10, 12 and 13.

10 Upon receipt of a complete notice under § 9, the Bureau shall examine each assignment in the notice with respect to its conformity with:

*a)* the Table of Frequency Allocations and the other provisions[[6]](#footnote-7)6 of the Radio Regulations, except those provisions relating to conformity with the FSS Plan and the procedures for obtaining coordination;

*b)* Annex 3 to Appendix **30B**;

*c)* the service area published under § 5;

*d)* the on-axis e.i.r.p. density and off-axis e.i.r.p. density of the assignments published under § 5, and

*e)* frequency band of the assignments published under § 5.

11 When the examination with respect to § 10 of an assignment received under § 9 leads to an unfavourable finding, the notice shall be returned to the notifying administration with an indication that subsequent resubmission under § 9 will be considered with a new date of receipt.

12 When the examination with respect to § 10 of an assignment received under § 9 leads to a favourable finding, the Bureau shall use the method of Annex 4 to examine if there is any administration and the corresponding:

*a)* allotment in the Plan;

*b)* assignment which appears in the List at the date of receipt of the examined notice submitted under § 1;

*c)* assignments which the Bureau has previously examined under § 6.5 of Article 6 of Appendix **30B** after receiving complete information in accordance with § 6.1 of that Article at the date of receipt of the examined notice submitted under § 1[[7]](#footnote-8)7,

considered as being affected and receiving more interference than that produced by the supporting Appendix **30B** assignment(s) and whose agreement has not been provided under § 9.

13 The Bureau shall determine if the cumulative interference is caused to an allotment in the Plan or an assignment in the List or an assignment for which the Bureau has received complete information in accordance with Article 6 of Appendix **30B** before the date of receipt of the complete notice under § 9. The cumulative interference shall be calculated based on Appendix 1 to Annex 4 of Appendix **30B**, taking into account assignments in the Appendix **30B** ESIM List together with assignments submitted under § 9. The cumulative interference is considered as being caused when the overall aggregate (*C*/*I*)*aggregate* value is less than that resulting from the supporting Appendix **30B** assignment(s) with a tolerance of 0.25 dB (inclusive of the 0.05 dB computational precision), except for an allotment in the Plan, an assignment stemming from the conversion of an allotment into an assignment without modification, or when the modification is within the envelope characteristics of the initial allotment, as well as assignments relating to application of Article 7 of Appendix **30B** for which the 0.05 dB computational precision is applicable.

14 In the event of a favourable finding under §§ 12 and 13, the Bureau shall enter the proposed assignment in the Appendix **30B** ESIM List and publish in a Special Section of its BR IFIC the characteristics of the assignment received under § 9, together with the names of administrations with which the provisions of this procedure have been successfully applied.

15 When the examination under § 12 or § 13 leads to an unfavourable finding with respect to allotments in the Plan, conversion of an allotment into an assignment without modification or with a modification which is within the envelope characteristics of the initial allotment, Article 7 request transferred to Article 6, or submission in accordance with Resolution **170 (WRC‑19)**, the Bureau shall return the notice to the notifying administration. In this case, the notifying administration undertakes not to bring into use the frequency assignments until the finding with respect to allotments in the Plan, conversion of an allotment into an assignment without modification or with a modification which is within the envelope characteristics of the initial allotment, Article 7 request transferred to Article 6, or submission in accordance with Resolution **170 (WRC‑19)**, is favourable. The Bureau, in returning the notice to the notifying administration, shall indicate that the subsequent resubmission under § 9 will be considered with a new date of receipt.

15*bis* When the examination under § 12 or § 13 leads to a favourable finding with respect to allotments in the Plan, conversion of an allotment into an assignment without modification or with a modification which is within the envelope characteristics of the initial allotment, Article 7 request transferred to Article 6, submission in accordance with Resolution **170 (WRC‑19)**, but an unfavourable finding with respect to others, and if the notifying administration insists that the proposed assignment be included in the Appendix **30B** ESIM List, the Bureau shall enter the assignment provisionally in the Appendix **30B** ESIM List with an indication of those administrations whose assignments were the basis of the unfavourable finding. To this effect, the notifying administration shall include a signed commitment, indicating that use of an assignment provisionally recorded in the Appendix **30B** ESIM List shall not cause unacceptable interference to, nor claim protection from, those assignments for which agreement still needs to be obtained. The entry in the Appendix **30B** ESIM List shall be changed from provisional to definitive only if the Bureau is informed that all required agreements have been obtained.

15*ter* Should the assignments that were the basis of the unfavourable finding not be brought into use within the period specified in § 6.1 of Article 6 of Appendix **30B** or within the extension period under § 6.31*bis* Article 6 of Appendix **30B**, then the status of the assignment in the Appendix **30B** ESIM List shall be reviewed accordingly.

16 Should unacceptable interference be caused by an assignment entered in the Appendix **30B** ESIM List under § 15*bis* to any assignment in the List which was the basis of the disagreement, the notifying administration of the assignment entered in the Appendix **30B** ESIM List under § 15*bis* shall, upon receipt of advice thereof, immediately eliminate this unacceptable interference.

17 For the examinations referred to in Part I and Part II, the Bureau shall generate a set of uplink grid points everywhere within the service area of the relevant assignments to A‑ESIMs and M‑ESIMs, assuming that A‑ESIMs and M‑ESIMs are located at these uplink grid points.

Section B – Procedure for notification and recording in the Master Register of assignments to earth stations in motion on aircraft and vessels dealt with under this Resolution

1 Any assignment in the ESIM List for which the relevant procedure of Section A and Part II of this Annex has been successfully applied shall be notified to the Bureau using the relevant characteristics listed in Appendix **4**, not earlier than three years before the assignments are brought into use.

2 If the first notice referred to in § 1 has not been received by the Bureau within the required period mentioned in § 1 of Section A, the assignments in the Appendix **30B** ESIM List shall be cancelled by the Bureau after having informed the administration at least three months before the expiry of this period.

3 Notices not containing those characteristics specified in Appendix **4** as mandatory or required shall be returned with comments to help the notifying administration to complete and resubmit them, unless the information not provided is immediately forthcoming in response to an inquiry by the Bureau.

4 Complete notices shall be marked by the Bureau with their date of receipt and shall be examined in the date order of their receipt. Following receipt of a complete notice, the Bureau shall, as soon as possible after the date of entry of the corresponding assignment into the Appendix **30B** ESIM List or within not more than two months if the corresponding assignment has already been entered into the Appendix **30B** ESIM List, publish its contents, with any diagrams and maps and the date of receipt, in the BR IFIC, which shall constitute the acknowledgement to the notifying administration of receipt of its notice. When the Bureau is not in a position to comply with the time-limit referred to above, it shall periodically so inform the administrations, giving the reasons thereof.

5 The Bureau shall not postpone the formulation of a finding on a complete notice unless it lacks sufficient data to reach a conclusion thereon.

6 Each notice shall be examined:

6.1 with respect to its conformity with the Table of Frequency Allocations and the other provisions[[8]](#footnote-9)8 of these Regulations, except those provisions relating to conformity with the FSS Plan and the procedures for obtaining coordination, which are the subject of the following subparagraph;

6.2 with respect to its conformity with the FSS Plan, the procedures for obtaining coordination and the associated provisions[[9]](#footnote-10)9.

7 When the examination with respect to § 6.1 leads to a favourable finding, the assignment shall be examined further with respect to § 6.2; otherwise, the notice shall be returned with an indication of the appropriate action.

8 When the examination with respect to § 6.2 leads to a favourable finding, the ESIM assignment shall be recorded in the Master Register. When the finding is unfavourable, the notice shall be returned to the notifying administration, with an indication of the appropriate action.

9 In every case when a new ESIM assignment is recorded in the Master Register it shall, in accordance with the provisions of this Resolution, include an indication of the finding reflecting the status of the assignment. This information shall also be published in the BR IFIC.

10 A notice of a change in the characteristics of the ESIM assignment already recorded, as specified in Appendix **4**, shall be examined by the Bureau under §§ 6.1 and 6.2, as appropriate. Any changes to the characteristics of an assignment that has been recorded and confirmed as having been brought into use shall be brought into use within eight years from the date of the notification of the modification. Any changes to the characteristics of an assignment that has been recorded but not yet brought into use shall be brought into use within the period provided for in § 1 of Section A.

11 In applying the provisions of this Section, any resubmitted notice which is received by the Bureau more than six months after the date on which the original notice was returned by the Bureau shall be considered to be a new notice.

12 All frequency assignments notified in advance of their being brought into use shall be entered provisionally in the Master Register. Any frequency assignment provisionally recorded under this provision shall be brought into use no later than the end of the period provided for in § 1 of Section A. Unless the Bureau has been informed by the notifying administration of the bringing into use of the assignment, it shall, no later than 15 days before the end of the regulatory period established under § 1 of Section A, send a reminder requesting confirmation that the assignment has been brought into use within the regulatory period. If the Bureau does not receive that confirmation within 30 days following the period provided under § 1 of Section A, it shall cancel the entry in the Master Register and the corresponding assignment in the Appendix **30B** ESIM List.

13 When the Bureau has received confirmation that the assignment in the Appendix **30B** ESIM List has been brought into use, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC.

14 Wherever the use of a frequency assignment in the Appendix **30B** ESIM List is suspended for a period exceeding six months, the notifying administration shall inform the Bureau of the date on which such use was suspended. When that assignment is brought back into use, the notifying administration shall so inform the Bureau, as soon as possible. On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC. The date on which the assignment is brought back into use shall be no later than three years from the date on which the use of the frequency assignment was suspended, provided that the notifying administration informs the Bureau of the suspension within six months from the date on which the use was suspended. If the notifying administration informs the Bureau of the suspension more than six months after the date on which the use of the frequency assignment was suspended, this three-year time period shall be reduced. In this case, the amount by which the three-year period shall be reduced shall be equal to the amount of time that has elapsed between the end of the six-month period and the date that the Bureau is informed of the suspension. If the notifying administration informs the Bureau of the suspension more than 21 months after the date on which the use of the frequency assignment was suspended, the frequency assignment shall be cancelled from the Master Register and the Appendix **30B** ESIM List.

15 If the supporting Appendix **30B** assignment(s) is cancelled from the List, the corresponding ESIM assignment shall also be cancelled from the Appendix **30B** ESIM List and the Master Register, as appropriate.

Part II

Procedure to be followed by the administrations and the Bureau for examination and protection of one ESIM with respect to the other ESIMs

1 In the publication of the Special Section referred to in § 5 of Section A, the Bureau shall also include the names of the affected administrations, the corresponding assignments in the Appendix **30B** ESIM List and assignments for which the Bureau has previously received complete information in accordance with § 1 of Section A and which it has examined under § 4 of Section A, as appropriate.

2 In determining administrations whose assignments in the Appendix **30B** ESIM List or assignments for which the Bureau has previously received complete information in accordance with § 1 of Section A and which it has examined under § 4 of Section A are considered as being affected, the Bureau shall apply the principle of Annex 4 to Appendix **30B** and the following criteria:

*a)* orbital spacing as specified in paragraph 1.2 of Annex 4;

*b)* Earth-to-space single-entry carrier-to-interference as specified in paragraph 2.1 of Annex 4 or Earth-to-space single-entry carrier-to-interference (*C*/*I*) derived from the supporting Appendix **30B** assignment(s), whichever is the lowest;

*c)* the Earth-to-space pfd as specified in paragraph 2.2 of Annex 4.

3 An administration that has not notified its comments either to the administration seeking agreement or to the Bureau within a period of four months following the date of the BR IFIC referred to in § 5 of Section A shall be deemed to have agreed to the proposed assignment. This time-limit shall be extended for an administration that has requested the assistance of the Bureau by up to thirty days following the date on which the Bureau communicated the result of its action.

4 Unless coordination is no longer required, taking into account the final characteristics of the notice in § 9 of Section A, should harmful interference be caused by an assignment included in Appendix **30B** ESIM List to any assignment in Appendix **30B** ESIM List identified in § 1 for which agreement has not been obtained, the notifying administration shall, upon receipt of advice thereof, immediately eliminate this harmful interference.

ANNEX 2 TO DRAFT NEW RESOLUTION [IAP-A115] (WRC‑23)

Provisions for earth stations on aircraft and vessels to protect terrestrial services in the frequency band 12.75-13.25 GHz

1 The parts below contain provisions to ensure that A‑ESIM and M‑ESIM do not cause unacceptable interference in neighbouring countries to terrestrial service operations when A‑ESIM and M‑ESIM operate in frequency bands overlapping with those used at any time by terrestrial services to which the frequency band 12.75-13.25 GHz is allocated and operating in accordance with the Radio Regulations (see also *resolves*1.2 of this Resolution).

Part I

Earth stations on vessels

2 The notifying administration of the GSO FSS network with which an M‑ESIM communicates shall ensure compliance of the M‑ESIM operating within the frequency band 12.75-13.25 GHz, or parts thereof, with both of the following conditions for the protection of terrestrial services to which the frequency band is allocated within a coastal State:

2.1 The minimum distance from the low-water mark as officially recognized by the coastal State beyond which an M‑ESIM can operate without the prior agreement of any administration is 150 km in the frequency band 12.75-13.25 GHz. Any transmissions from an M‑ESIM within the minimum distance shall be subject to the prior agreement of the coastal State concerned.

2.2 The maximum earth station on vessel e.i.r.p. spectral density towards the horizon shall be limited to 12.5 dB(W/MHz). Transmissions from an M‑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 coastal State concerned.

Part II

Earth stations on aircraft

3 The notifying administration of the GSO FSS satellite network with which an A‑ESIM communicates shall ensure compliance of the A‑ESIM operating within the frequency band 12.75-13.25 GHz, or parts thereof, with all of the following conditions for the protection of terrestrial services to which the frequency band is allocated:

PFD MASK

1 When within line-of-sight of the territory of an administration, and above an altitude of 3 km, the maximum pfd produced at the surface of the Earth on the territory of an administration by emissions from a single A‑ESIM shall not exceed:

 pfd(θ) = −112 (dB(W/(m2 · 14 MHz))) for θ ≤ 5°

 pfd(θ) = −117 + θ (dB(W/(m2 · 14 MHz))) for 5° < θ ≤ 40°

 pfd(θ) = −77 (dB(W/(m2 · 14 MHz))) for 40° < θ ≤ 90°

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

2 When within line-of-sight of the territory of an administration, and up to an altitude of 3 km, the maximum pfd produced at the surface of the Earth on the territory of an administration by emissions from a single aeronautical ESIM shall not exceed:

 pfd(θ) = −123.5 dB(W/(m2 · MHz)) for θ ≤ 5°

 pfd(θ) = −128.5 + θ dB(W/(m2 · MHz)) for 5° < θ ≤ 40°

 pfd(θ) = −88.5 dB(W/(m2 · MHz)) for 40° < θ ≤ 90°

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

ANNEX 3 TO DRAFT NEW RESOLUTION [IAP-A115] (WRC‑23)

Provisions for earth stations in motion on aircraft and vessels to protect non-GSO FSS in the frequency band 12.75-13.25 GHz

1 In order to protect the non-GSO FSS systems referred to in *resolves*1.1.5 of this Resolution in the frequency band 12.75-13.25 GHz, ESIMs shall not exceed the following operational limits:

*a)* on-axis e.i.r.p. density of 49 dB(W/1 MHz) for an ESIM with an antenna maximum gain lower than 38.5 dBi;

*b)* on-axis e.i.r.p. density of 54 dB(W/1 MHz) for an ESIM with an antenna maximum gain equal to or greater than 38.5 dBi but lower than 45 dBi;

*c)* on-axis e.i.r.p. density of 57.5 dB(W/1 MHz) for an ESIM with an antenna maximum gain equal to or greater than 45 dBi;

*d)* e.i.r.p. density for any off-axis angle  which is 3° or more off the main-lobe axis of an ESIM antenna and outside 3° of the GSO arc:

|  |  |
| --- | --- |
| *Off-axis angle* | *Maximum e.i.r.p. density* |
| 3   31.6 | 37 − 25 log | dB(W/40 kHz) |
| 31.6  180 | −0.5 | dB(W/40 kHz) |

2 the Radiocommunication Bureau shall not make any examination or finding with respect to compliance with this Annex under either Article **9** or **11**.

ANNEX 4 TO DRAFT NEW RESOLUTION [IAP-A115] (WRC‑23)

Methodology with respect to the examination of compliance of A-ESIM with pfd limits in Part II of Annex 2

# 1 Overview

The methodology below is a functional description to conduct examination of A‑ESIM operating with GSO satellite networks and their conformity with power-flux density limits specified in Part II of Annex 2.

# 2 A-ESIM parameters required for the examination

To conduct the relevant examination of A‑ESIM and their conformity with respect to the pfd limits, the following parameters are required:

‒ Satellite network name

‒ A-ESIM peak antenna gain

‒ A-ESIM antenna pattern

‒ A-ESIM minimum elevation

‒ A-ESIM power density and bandwidth as given in Table 1

‒ Fuselage attenuation mask expressed as a function of the angle below the horizon of the A‑ESIM based on ITU‑R Reports or Recommendations.

# 3 Examination methodology

## 3.1 Introduction

An A‑ESIM can operate at different locations defined by latitude, longitude and altitude. This methodology determines the maximum allowable Power *Pj* for an A‑ESIM transmitter communicating with a GSO FSS satellite to ensure compliance with the pre-established pfd limits to protect terrestrial services, at all positions, for a defined set of altitude ranges. The methodology derives the *Pj*taking into account the relevant loss and attenuation in the geometry considered.

The methodology then compares the computed *Pj* with the range of notified power for the A‑ESIM emission. The minimum and the maximum powers values of the emission *Pmin\_emission,j* and *Pmax\_emission,j* of the A‑ESIM are calculated from the data included in the Appendix **4** Notification information of the GSO satellite network with which the A‑ESIM communicates and from the A‑ESIM characteristics.

A‑ESIM are evaluated over a number of predefined altitude ranges in order to establish a number of *Pj*levels.

An examination by the Bureau should apply this methodology for the defined altitude range, to determine whether the A‑ESIM operating under a given GSO satellite network complies with the pre-established pfd limits to protect terrestrial services.

## 3.2 Parameters and Geometry

Considering a hypothetical GSO FSS network, Table 1 below provides an example of emissions that are included in one Group transmitting in the 12.75-13.25 GHz band. Tables 2 to 4 provide additional assumptions and Figure 1 illustrates the geometry involved in the examination.

TABLE 1

Example of a group of A-ESIM emissions
(with reference to relevant RR Appendix 4 data fields)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Emission n. | C7aDesignation of emission | *BWemission*MHz | C8a3minimum power density dB(W/Hz) | C8a2 Maximum power density dB(W/Hz) |
| 1 | 6M00G7W-- | 6.0 | −69.7 | −66.0 |

TABLE 2

Additional example assumptions

| ID | Parameter | Notation | Value | Unit |
| --- | --- | --- | --- | --- |
| 1 | Frequency assignment | *f* | 13 | GHz |
| 2 | Reference bandwidth of pfd mask | *BWRef* | 1.0 or 14.0, depending on the altitude under examination | MHz |
| 6 | A-ESIM antenna peak gain | *Gmax* | 36 | dBi |
| 7 | A-ESIM antenna gain pattern | – | As per Recommendation ITU-R S.580(see C.10.d.5.a) |

TABLE 3

Additional assumptions defined in the methodology

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *ID* | Parameter | Notation | Value | Unit |
| 8 | A-ESIM minimum elevation angle towards GSO satellite | *ε* | RR Appendix 4 C.10.d.10 | degrees |
| 9 | Atmospheric attenuation | *Latm* | Computed with Rec. ITU-R P.676 (see NOTE below) | dB |
| 10 | Angle of arrival of the incident wave on the Earth’s surface | $$δ$$ | Specified by the pre-established sets of PFD limits, variable from 0° to 90° | deg |
| 11 | Minimum examination altitude | *Hmin* | 0.01 | km |
| 12 | Maximum examination altitude | *Hmax* | 15.0 | km |
| 13 | Examination altitude spacing[[10]](#footnote-11)10 | *Hstep* | 1.0 | km |
| 14 | Fuselage attenuation | *Lf* | Computed based on ITU-R Reports or Recommendations (see Table 4) | dB |

NOTE: The atmospheric attenuation is computed with Recommendation ITU‑R P 676, with the mean annual global reference atmosphere as defined in Recommendation ITU‑R P 835

Figure 1

Geometry for the examination of compliance for two different A-ESIM altitudes



TABLE 4

Fuselage Attenuation Model

|  |  |  |  |
| --- | --- | --- | --- |
| *Lfuse*(γ) = 3.5 + 0.25 · γ | dB | for | 0°≤ γ ≤ 10° |
| *Lfuse*(γ) = −2 + 0.79 · γ | dB | for | 10°< γ ≤ 34° |
| *Lfuse*(γ) = 3.75 + 0.625 · γ | dB | for | 34°< γ ≤ 50° |
| *Lfuse*(γ) = 35 | dB | for | 50°< γ ≤ 90° |

Notes:

• This fuselage attenuation model is based on measurements made at 14.2 GHz (see Figure 3.6-14 in Report ITU‑R M.2221-0)

Tables 5A and 5B are taken from Part II of Annex 2.The reference bandwidth for the sets of pfd limits included in Tables 5A and 5B are 1 MHz and 14 MHz, respectively.

TABLE 5A

Required conformance pfd mask for altitudes up to 3 km

 pfd(θ) = −123.5 dB(W/(m2 · MHz)) for θ ≤ 5°

 pfd(θ) = −128.5 + θ dB(W/(m2 · MHz)) for 5° < θ ≤ 40°

 pfd(θ) = −88.5 dB(W/(m2 · MHz)) for 40° < θ ≤ 90°

TABLE 5B

Required conformance pfd mask for altitudes above 3 km

 pfd(θ) = −112 (dB(W/(m2 · 14 MHz))) for θ ≤ 5°

 pfd(θ) = −117 + θ (dB(W/(m2 · 14 MHz))) for 5° < θ ≤ 40°

 pfd(θ) = −77 (dB(W/(m2 · 14 MHz))) for 40° < θ ≤ 90°

## 3.3 Calculation algorithm

This section includes a step-by-step description of how the examination methodology would be implemented.

***START***

i) For each A‑ESIM altitude, it is necessary to generate as many $δ\_{n}$ angles (angle of arrival of the incident wave) as required in order to test the full compliance with the applicable set of pfd limits. The *N* angles $δ\_{n}$ must be comprised between 0° and 90° and have a resolution compatible with the granularity of the pre-established pfd limits. Each of the angles $δ\_{n}$ will correspond to as many *N* points on the ground.

ii) For each altitude *Hj*= *Hmin*, *Hmin*+ *Hstep*, …, *Hmax*:

a) set the altitude of the *A\_ESIM* to *Hj*

b) compute the angles below the horizon $γ\_{j,n}$ as seen from the A‑ESIM for each of the *N* angles $δ\_{n}$ generated in i) using the following equation:

  (2)

where *Re* is the mean earth radius.

c) Compute the distance *Dj,n*, in km, for *n*= *1, …, N* between the A‑ESIM and the tested point on the ground:

  (3)

d) Compute the fuselage attenuation *Lf j,n* (dB) with *n* = *1, …, N* applicable to each of the angles γ*j,n* computed in b) above.

e) Compute the gaseous absorption *Latm\_j,n* (dB) with *n*= *1, …, N* applicable to each of the distances *Dj,n* computed in c) above, using the applicable sections of Recommendation ITU‑R P.676.

iii)

a) For each altitude *Hj*= *Hmin*, *Hmin*+ *Hstep*, …, *Hmax*, and each angle below the horizon γ*j,n*, compute the maximum emission power in the reference bandwidth *Pj,n* (δ*n*, γ*j,n*) for which the pfd limits are met using the following algorithm:

 

 With being the transmit antenna gain with the off-axis angle from the boresight, consisting of the summation of both angles γ*j,n* and minimum elevation angle ε as defined in Table 3.

b) Compute the minimum *Pj* across all values calculated at the previous step,

 *Pj* = Min ()

 The output of this step is the maximum power in the reference bandwidth that can be used by the A‑ESIM to ensure it complies with the PFD limits indicated in Table 5A or Table 5B, as applicable, with respect to all angles $δ\_{n}$ at the altitude *Hj*, and the elevation indicated in Table 3. There will be one *Pj* for each of the *Hj* altitudes considered.

The output of step b) is summarized in Table 6 below:

TABLE 6

Computed *Pj* values

|  |  |
| --- | --- |
| *Hj* (Altitude) | *Pj*(Maximum power in the reference bandwidth that can be used at minimum elevation) |
| (km) | dB(W/BW) |
| 0.01 | *TBD* |
| 1.0 | *TBD* |
| 2.0 | *TBD* |
| 2.99 | *TBD* |
| 4.0 | *TBD* |
| 5.0 | *TBD* |
| 6.0 | *TBD* |
| 7.0 | *TBD* |
| 8.0 | *TBD* |
| 9.0 | *TBD* |
| 10.0 | *TBD* |
| 11.0 | *TBD* |
| 12.0 | *TBD* |
| 13.0 | *TBD* |
| 14.0 | *TBD* |
| 15.0 | *TBD* |

c) For each altitude *Hj*= *Hmin*, *Hmin*+ *Hstep*, …, *Hmax*, and each of the emission of the groups of emissions under examination, compute the minimum and the maximum powers of the emission in the reference bandwidth:

 

 

 BW in Hz is:

*BWRef* if *BWRef* =1 MHz

*BWRef* if *BWRef* =14 MHz & *BWemission* >= *BWRef*

*BWemission* if *BWRef* =14 MHz & *BWemission* < *BWRef*

d) For each of the emission of the groups of emissions under examination check if there is at least one altitude *Hj*for which:

 *Pmax\_emission,j ˃ Pj ˃ Pmin\_emission,j*

 The results of this check are illustrated in Table 7 below.

TABLE 7

Example comparison between *Pj* and (*Pmin\_emission,j*; *Pmax\_emission,j*$)$

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Emission n. | C7aDesignation of emission | BWemissionMHz | C8a3minimum power density dB(W/Hz) | C8a2 Maximum power density dB(W/Hz) | Lowest altitude *Hj* (km) for which *Pmax\_emission,j* *>Pj* > *Pmin\_emission,j*  |
| 1 | 6M00G7W-- | 6.0 | –69.7 | –66.0 | TBD |

e) Based on the test detailed in iii)d) above applied to all emissions of the group under examination, the results of the Bureau’s examination for that group is favourable, after removing emissions that have failed the examination, otherwise it is unfavourable (i.e. all emissions have failed).

iv) The output of this methodology should, at a minimum, include:

– those resulting parameters as contained in Table 6;

– the examination results for each group;

– for those cases when some emissions successfully pass and some do not, the examination results for resulting new group that includes only those emission(s) which successfully passed the examination.

**END**

**Reasons:** This proposal includes the methodology adopted by Working Party 4A for the BR to examine the PFD limits to protect terrestrial services.

APPENDIX 4 (REV.WRC‑19)

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[[11]](#footnote-12)2    (Rev.WRC‑12)

Footnotes to Tables A, B, C and D

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**TABLE A**

GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK OR SYSTEM,
EARTH STATION OR RADIO ASTRONOMY STATION     (Rev.WRC‑23)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Items in Appendix** | ***A \_ GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK OR SYSTEM, EARTH STATION OR RADIO ASTRONOMY STATION*** | **Advance publication of a geostationary-satellite network** | **Advance publication of a non-geostationary-satellite network or system subject to coordination under Section II of Article 9** | **Advance publication of a non-geostationary-satellite network or system 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 or system** | **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) or for Appendix 30B ESIM in accordance with draft new Resolution [IAP-A115] (WRC-23)** | **Items in Appendix** | **Radio astronomy** |
| **A.1** | **IDENTITY OF THE SATELLITE NETWORK OR SYSTEM, EARTH STATION OR RADIOASTRONOMY STATION** |  | **A.1** |  |
| A.1.a | the identity of the satellite network or system | **X** | **X** | **X** | **X** | **X** |  | **X** | **X** | **X** | A.1.a |  |
| A.1.b | the beam identificationIn the case of Appendix **30** or **30A**, required only for modification, suppression or notification of Plan assignmentsIn the case of Appendix **30B**, required only for a network derived from the Allotment Plan |  |  |  |  |  |  | **+** | **+** | **+** | A.1.b |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| A.1.f | **Administration and intergovernmental organization symbol:** |  |  |  |  |  |  |  |  |  | A.1.f |  |
| A.1.f.1 | the symbol of the notifying administration (see the Preface) | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | A.1.f.1 | **X** |
| A.1.f.2 | if the notice is submitted by the notifying administration in association with other administrations, the symbols of each of the administrations (see the Preface) | **+** | **+** | **+** | **+** | **+** |  | **+** | **+** | **+** | A.1.f.2 |  |
| A.1.f.3 | if the notice is submitted on behalf of an intergovernmental satellite organization, the symbol of that organization (see the Preface) | **+** | **+** | **+** | **+** | **+** |  | **+** | **+** | **+** | A.1.f.3 |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **A.2** | **DATE OF BRINGING INTO USE** |  | **A.2** |  |
| A.2.a | the date (actual or foreseen, as appropriate) of bringing the frequency assignment (new or modified) into useFor a frequency assignment to a GSO space station, including frequency assignments in Appendices **30**, **30A** and **30B**, and for a frequency assignment to Appendix **30B** ESIM, the date of bringing into use is as defined in Nos. **11.44B** and **11.44.2**For a frequency assignment to a non-GSO space station, the date of bringing into use is as defined in Nos. **11.44C**, **11.44D**, **11.44E** and**11.44.2**, as applicableFor a frequency assignment to a non-GSO satellite system with a short-duration mission, the date of bringing into use is as defined in Resolution **32 (WRC‑19)**Whenever the assignment is changed in any of its basic characteristics (except for a change under A.1.a), the date to be given shall be that of the latest change (actual or foreseen, as appropriate)Required only for notification and, in the case of Appendices **30** and **30A**, also for simultaneous submissions for modifications to the Region 2 Plan or entry into the Regions 1 and 3 List under Article 4 and notification under Article 5, and, in the case of Appendix **30B**, also for simultaneous submissions for entry into the List under § 6.17 and notification under § 8.1 and, in the case of Appendix **30B** ESIM, also for simultaneous submissions for entry in the Appendix **30B** ESIM List and notification under Section A and Section B, respectively, of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC‑23)** |  |  |  | **+** | **+** | **+** | **+** | **+** | **+** | A.2.a |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **A.3** | **OPERATING ADMINISTRATION OR AGENCY** |  | **A.3** |  |
| A.3.a | the symbol for the operating administration or agency (see the Preface) that is in operational control of the space station, earth station or radio astronomy station |  |  | **X** | **X** | **X** | **X** | **X** | **X** | **X** | A.3.a | **X** |
| A.3.b | the symbol for the address of the administration (see the Preface) to which communication should be sent on urgent matters regarding interference, quality of emissions and questions referring to the technical operation of the network or system or station (see Article **15**) |  |  | **X** | **X** | **X** | **X** | **X** | **X** | **X** | A.3.b | **X** |
| **A.4** | **ORBITAL INFORMATION** |  | **A.4** |  |
| A.4.a | **For a space station onboard a geostationary-satellite:** |  |  |  |  |  |  |  |  |  | A.4.a |  |
| A.4.a.1 | the nominal geographical longitude on the geostationary-satellite orbit (GSO) | **X** |  |  | **X** |  |  | **X** | **X** | **X** | A.4.a.1 |  |
| A.4.a.2 | **Orbital tolerances** |  |  |  |  |  |  |  |  |  | A.4.a.2 |  |
| A.4.a.2.a | the planned longitudinal tolerance easterly limit |  |  |  | **X** |  |  | **X** | **X** | **X** | A.4.a.2.a |  |
| A.4.a.2.b | the planned longitudinal tolerance westerly limit |  |  |  | **X** |  |  | **X** | **X** | **X** | A.4.a.2.b |  |
| A.4.a.2.c | the planned inclination excursion |  |  |  | **X** |  |  |  |  | **X** | A.4.a.2.c |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **A.6** | **AGREEMENTS** |  | **A.6** |  |
| A.6.a | if appropriate, the symbol of any administration or administration representing a group of administrations (see the Preface) with which agreement has been reached, including where the agreement is to exceed the limits prescribed in these Regulations |  |  |  | **+** | **+** |  **+ 1** | **+** | **+** | **+** | A.6.a |  |
| A.6.a.1 | the name of satellite network or system with which agreement has been reached for all notified assignments |  |  |  | **O** |  |  |  |  |  | A.6.a.1 |  |
| A.6.b | if appropriate, the symbol of any intergovernmental organization (see the Preface) with which agreement has been reached, including where the agreement is to exceed the limits prescribed in these Regulations |  |  |  | **+** | **+** |  **+ 1** | **+** | **+** | **+** | A.6.b |  |
| A.6.b.1 | the name of satellite network or system with which agreement has been reached for all notified assignments |  |  |  | **O** |  |  |  |  |  | A.6.b.1 |  |
| A.6.c | if agreement has been reached, the related provision code (see the Preface) |  |  |  | **+** | **+** |  **+ 1** | **+** | **+** | **+** | A.6.c |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **A.13** | **REFERENCES TO THE PUBLISHED SPECIAL SECTIONS OF THE BUREAU'S INTERNATIONAL FREQUENCY INFORMATION CIRCULAR (see the Preface)** |  | **A.13** |  |
| A.13.a | the reference and number of the advance publication information in accordance with No. 9.**1** or No. **9.1A** |  |  |  | **X** | **X** | **X** |  |  |  | A.13.a |  |
| A.13.b | the reference and number of the coordination request in accordance with No. **9.6**For the notification of an earth station, the reference to the Special Section of the associated satellite network or system has to be providedFor the notification of an earth station coordinated under No. **9.7A**, the coordination Special Section number of this earth station has to be provided |  |  |  | **X** | **X** | **X** |  |  |  | A.13.b |  |
| A.13.c | the reference and number of the information in accordance with Article 4 of Appendix **30** |  |  |  |  |  |  | **X** |  |  | A.13.c |  |
| A.13.d | the reference and number of the information in accordance with Article 4 of Appendix **30A** |  |  |  |  |  |  |  | **X** |  | A.13.d |  |
| A.13.e | the reference and number of the information in accordance with Article 6 of Appendix **30B**For Appendix **30B** ESIM, the reference and number of the information in accordance with draft new Resolution **[IAP-A115] (WRC‑23)** and the reference to the supporting Appendix **30B** assignment(s) |  |  |  |  |  | **X** |  |  | **+** | A.13.e |  |
| … |  |  |  |  |
| **A.19** | **COMPLIANCE WITH § 6.26 OF ARTICLE 6 OF APPENDIX 30B OR WITH OTHER PROVISIONS REFERENCED BY ARTICLE 5** |  | **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 only if the notice is submitted under § 6.25 of Article 6 of Appendix **30B** or under paragraph 15*bis* of Section A of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC‑23)** |  |  |  |  |  |  |  |  | **+** | A.19.a |  |
| **A.25** | **COMPLIANCE WITH *resolves* 1.1.2 OF DRAFT NEW RESOLUTION [IAP-A115] (WRC‑23)** |  | **A.25** |  |
| A.25.a | not required for Appendix **30B**a commitment that the characteristics of Appendix **30B** ESIM shall remain within the envelope of typical characteristics of notified Appendix **30B** earth stations associated with the satellite networks with which ESIM communicate, as published by the Bureau Required only for the notification of earth stations in motion submitted in accordance with draft new Resolution **[IAP-A115] (WRC‑23)** |  | A.25.a |  |
| **A.26** | **COMPLIANCE WITH *resolves* 1.1.3 OF DRAFT NEW RESOLUTION [IAP-A115] (WRC-23)** |  |  |  |  |  |  |  |  |  | **A.26** |  |
| A.26.a | not required for Appendix **30B**a commitment that the Appendix **30B** ESIM operation would be in conformity with the Radio Regulations and draft new Resolution **[IAP-A115] (WRC‑23)**Required only for the notification of earth stations in motion submitted in accordance with draft new Resolution **[IAP-A115] (WRC‑23)** |  |  |  |  |  |  |  |  | **+** | A.26.a |  |
| **A.27** | **COMPLIANCE WITH *resolves* 1.2.6 OF DRAFT NEW RESOLUTION [IAP-A115] (WRC‑23)** |  |  |  |  |  |  |  |  |  | **A.27** |  |
| A.27.a | not required for Appendix **30B**a commitment that aeronautical Appendix **30B** ESIMs would be in conformity with the pfd limits on the Earth’s surface specified in Part II of Annex 2 to draft new Resolution **[IAP-A115] (WRC‑23)**Required only for the notification of earth stations in motion submitted in accordance with draft new Resolution **[IAP-A115] (WRC‑23)** |  |  |  |  |  |  |  |  | **+** | A.27.a |  |
| **A.28** | **COMPLIANCE WITH *resolves*1.2.9 and *resolves further*2 OF DRAFT NEW RESOLUTION [IAP-A115] (WRC‑23)** |  |  |  |  |  |  |  |  |  | **A.28** |  |
| A.28.a | not required for Appendix **30B**a commitment that, upon receiving a report of unacceptable interference, the notifying administration for the GSO FSS network with which Appendix **30B** ESIM communicate shall follow the procedures in *resolves*9 of draft new Resolution **[IAP-A115] (WRC-23)**Required only for the notification of earth stations in motion submitted in accordance with draft new Resolution **[IAP-A115] (WRC-23)** |  |  |  |  |  |  |  |  | **+** | A.28.a |  |

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**TABLE B**

CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR
EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA    (Rev.WRC‑23)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Items in Appendix** | ***B \_ CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA*** | **Advance publication of a geostationary-satellite network** | **Advance publication of a non-geostationary-satellite network or system subject to coordination under Section II of Article 9** | **Advance publication of a non-geostationary-satellite network or system 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 or system** | **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) or for Appendix 30B ESIM in accordance with draft new Resolution [IAP-A115] (WRC-23)** | **Items in Appendix** | **Radio astronomy** |
| **B.1** | **IDENTIFICATION AND DIRECTION OF THE SATELLITE ANTENNA BEAM** |  | **B.1** |  |
| B.1.a | the designation of the satellite antenna beamFor an earth station, the designation of the satellite antenna beam of the associated space station |  |  | **X** | **X** | **X** | **X** | **X** | **X** | **X** | B.1.a |  |
| B.1.b | an indicator showing whether the antenna beam, under B.1.a, is fixed or whether it is steerable and / or reconfigurable |  |  | **X** | **X** | **X** |  | **X** | **X** | **X** | B.1.b |  |
| B.1.c | if the beam is part of a multiple-beam network, the multiple beam identification code |  |  |  |  |  |  |  |  | **+** | B.1.c |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **B.2** | **TRANSMISSION / RECEPTION INDICATOR FOR THE BEAM OF THE SPACE STATION OR THE ASSOCIATED SPACE STATION** |  |  | **X** | **X** | **X** |  **+ 1** |  |  | **X** | **B.2** |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **B.3** | **SPACE STATION ANTENNA CHARACTERISTICS** |  | **B.3** |  |
| B.3.a | **For each space station antenna:** |  |  |  |  |  |  |  |  |  | B.3.a |  |
| B.3.a.1 | the maximum co-polar isotropic gain, in dBiWhere a steerable beam (see No. **1.191**) is used, if the effective boresight area (see No. **1.175**) is identical with the global service area, the maximum antenna gain, in dBi, is applicable to all points on the Earth’s visible surface |  |  | **X** | **X** | **X** |  | **X** | **X** | **X** | B.3.a.1 |  |
| B.3.a.2 | if a non-elliptical beam, the maximum cross-polar isotropic antenna gain, in dBi |  |  |  |  |  |  | **+** | **+** |  | B.3.a.2 |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Items in Appendix** | ***B \_ CHARACTERISTICS TO BE PROVIDED FOR EACH SATELLITE ANTENNA BEAM OR EACH EARTH STATION OR RADIO ASTRONOMY ANTENNA*** | **Advance publication of a geostationary-satellite network** | **Advance publication of a non-geostationary-satellite network or system subject to coordination under Section II of Article 9** | **Advance publication of a non-geostationary-satellite network or system 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 or system** | **Notification or coordination of an earth station (including notification under Appendices 30A or 30B)**  | **Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)** | **Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)** | **Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)** | **Items in Appendix** | **Radio astronomy** |
| B.3.b | **Antenna gain contours:** |  |  |  |  |  |  |  |  |  | B.3.b |  |
| B.3.b.1 | the co-polar antenna gain contours plotted on a map of the Earth’s surface, preferably in a radial projection from the satellite onto a plane perpendicular to the axis from the centre of the Earth to the satelliteThe space station antenna gain contours shall be drawn as isolines of the isotropic gain, at least for −2, −4, −6, −10 and −20 dB and at 10 dB intervals thereafter, as necessary, relative to the maximum antenna gain, when any of these contours is located either totally or partially anywhere within the limit of visibility of the Earth from the given geostationary satelliteWhenever possible, the gain contours of the space station antenna should also be provided in a numerical format (e.g. equation or table)Where a steerable beam (see No. **1.191**) is used, if the effective boresight area (see No. **1.175**) is less than the global service area, the contours are the result of moving the boresight of the steerable beam around the limit defined by the effective boresight area and are to be provided as described above but shall also include the 0 dB relative gain isoline. In addition, for a steerable transmitting beam, except for the case of Appendix **30B**, see also No. **21.16** (and its associated Rules of Procedure) |  |  |  | **X** |  |  | **+** | **+** | **+** | B.3.b.1 |  |
|  | The antenna gain contours shall include the effects of the planned inclination excursion, longitudinal tolerance and the planned pointing accuracy of the antenna*Note* – Taking due account of applicable technical restrictions and allowing some reasonable degree of flexibility for satellite operations, administrations should, to the extent practicable, align the areas the satellite steerable beams could cover with the service area of their networks or systems with due regard to their service objectives.In the case of Appendix **30**, **30A,** **30B** or Appendix **30B** ESIM, required only for non-elliptical beams |  |  |  |  |  |  |  |  |  |  |  |
| B.3.b.2 | if a non-elliptical beam, the cross-polar gain contours shall be provided as defined under B.3.b.1 |  |  |  |  |  |  | **+** | **+** |  | B.3.b.2 |  |
| B.3.c | **Antenna radiation patterns:** |  |  |  |  |  |  |  |  |  | B.3.c |  |
| B.3.c.1 | the co-polar antenna radiation pattern |  |  | **X** | **+** | **X** |  | **+** | **+** | **+** | B.3.c.1 |  |
| In the case of geostationary space stations required only for an antenna radiation beam that is directed towards another satelliteIn the case of Appendix **30**, **30A,** **30B** or Appendix **30B** ESIM, required only for elliptical antenna beams |   |
| B.3.c.2 | if an elliptical beam, the cross-polar antenna radiation pattern |  |  |  |  |  |  | **+** | **+** |  | B.3.c.2 |  |
| B.3.d | the pointing accuracy of the antennaIn the case of Appendix **30**, **30A,** **30B** or Appendix **30B** ESIM, required only for elliptical beams |  |  |  | **X** |  |  | **+** | **+** | **+** | B.3.d |  |
| B.3.e | if the space station is operating in a frequency band allocated in the Earth-to-space direction and in the space-to-Earth direction, the gain of the antenna in the direction of those parts of the geostationary-satellite orbit which are not obstructed by the Earth. In the case of Appendix 30, required only for the frequency band 12.5‑12.7 GHz |  |  |  | **+** |  |  | **+** | **+** |  | B.3.e |  |
| B.3.f | **For a space station submitted in accordance with Appendix 30, 30A, 30B** or Appendix **30B** ESIM**:** |  |  |  |  |  |  |  |  |  | B.3.f |  |
| B.3.f.1 | the boresight or aim point of the antenna beam (longitude and latitude) |  |  |  |  |  |  | **X** | **X** | **X** | B.3.f.1 |  |
| B.3.f.2 | **For each elliptical beam:** |  |  |  |  |  |  |  |  |  | B.3.f.2 |  |
| B.3.f.2.a | the rotational accuracy, in degrees |  |  |  |  |  |  | **X** | **X** | **X** | B.3.f.2.a |  |
| B.3.f.2.b | the major axis orientation, in degrees, anticlockwise from the Equator |  |  |  |  |  |  | **X** | **X** | **X** | B.3.f.2.b |  |
| B.3.f.2.c | the major axis, in degrees, at the half-power beamwidth |  |  |  |  |  |  | **X** | **X** | **X** | B.3.f.2.c |  |
| B.3.f.2.d | the minor axis, in degrees, at the half-power beamwidth |  |  |  |  |  |  | **X** | **X** | **X** | B.3.f.2.d |  |

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**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      (Rev.WRC‑23)

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 or system subject to coordination under Section II of Article 9** | **Advance publication of a non-geostationary-satellite network or system 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 or system** | **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) or for Appendix 30B ESIM in accordance with draft new Resolution [IAP-A115] (WRC-23)** | **Items in Appendix** | **Radio astronomy** |
| **C.1** | **FREQUENCY RANGE** |  | **C.1** |  |
| C.1.a | the lower limit of the frequency range within which the carriers and the bandwidth of the emission will be located for each Earth-to-space or space-to-Earth service area, or for each space-to-space relay | **X** | **X** | **X** |  |  |  |  |  | **X** | C.1.a |  |
| C.1.b | the upper limit of the frequency range within which the carriers and the bandwidth of the emission will be located for each Earth-to-space or space-to-Earth service area, or for each space-to-space relay | **X** | **X** | **X** |  |  |  |  |  | **X** | C.1.b |  |
| **C.2** | **ASSIGNED FREQUENCY (FREQUENCIES)** |  | **C.2** |  |
| C.2.a.1 | the assigned frequency (frequencies), as defined in No. **1.148**– in kHz up to 28 000 kHz inclusive– in MHz above 28 000 kHz to 10 500 MHz inclusive– in GHz above 10 500 MHzIf the basic characteristics are identical, with the exception of the assigned frequency, a list of frequency assignments may be providedIn the case of advance publication, required only for active sensorsIn the case of geostationary and non-geostationary-satellite networks or systems, required for all space applications except passive sensorsIn the case of Appendix **30B**, required only for notification under Article **8**In the case of Appendix **30B** ESIM, required only for notification under Section B of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC‑23)** |  |  | **+** | **+** | **+** | **X** | **X** | **X** | **+** | C.2.a.1 |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **C.3** | **ASSIGNED FREQUENCY BAND** |  | **C.3** |  |
| C.3.a | the bandwidth of the assigned frequency band, in kHz (see No. **1.147**)In the case of advance publication, required only for active sensorsIn the case of geostationary and non-geostationary-satellite networks or systems, required for all space applications except passive sensorsIn the case of Appendix **30B**, required only for notification under Article **8**In the case of Appendix **30B** ESIM, required only for notification under Section B of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC‑23)** |  |  | **+** | **+** | **+** | **X** | **X** | **X** | **+** | C.3.a |  |
| **C.4** | **CLASS OF STATION AND NATURE OF SERVICE** |  | **C.4** |  |
| C.4.a | the class of station, using the symbols from the Preface |  |  | **X** | **X** | **X** | **X** | **X** | **X** | **X** | C.4.a | **X** |
| C.4.b | the nature of service performed, using the symbols from the Preface |  |  | **X** | **X** | **X** | **X** |  |  |  | C.4.b | **X** |
| **C.5** | **RECEIVING SYSTEM NOISE TEMPERATURE** |  | **C.5** |  |
| C.5.a | the lowest total receiving system noise temperature, in kelvins, referred to the output of the receiving antenna of the space stationIn the case of satellite networks or systems, required for all space applications except for active or passive sensors |  |  | **+** | **+** | **+** |  |  | **X** | **X** | C.5.a |  |
| … |  |  |  |  |  |  |  |  |  |  | C.5.c | **X** |
| **C.7** | **NECESSARY BANDWIDTH AND CLASS OF EMISSION***(in accordance with Article****2*** *and Appendix****1****)*For advance publication of a non-geostationary-satellite network or system not subject to coordination under Section II of Article **9**, changes to this information within the limits specified under C.1 shall not affect consideration of notification under Article **11**Not required for active or passive sensors |  | **C.7** |  |
| C.7.a | the necessary bandwidth and the class of emission: for each carrierIn the case of Appendix 30B, required only for notification under Article **8** (including simultaneous submissions for entry into the List under § 6.17 and notification under § 8.1)*Note* – For simultaneous submissions, the Bureau will use predefined values for the necessary bandwidth when examining the notice under § 6.17 of Article 6 of Appendix 30BIn the case of Appendix **30B** ESIM, required only for notification under Section B of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC‑23)** (including simultaneous submissions for entry in the Appendix **30B** ESIM List and notification under Section A and Section B, respectively, of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC‑23)***Note* – For simultaneous submissions, the Bureau will use predefined values for the necessary bandwidth when examining the notice under Annex 1 (except Section B) of draft new Resolution **[IAP-A115] (WRC‑23)** |  |  | **X** | **X** | **X** | **X** | **X** | **X** | **+** | C.7.a |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **C.8** | **POWER CHARACTERISTICS OF THE TRANSMISSION***Not required for passive sensors* |  | **C.8** |  |
| C.8.a | **For the case where individual carriers can be identified:** |  |  |  |  |  |  |  |  |  | C.8.a |  |
| C.8.a.1 | the maximum value of the peak envelope power, in dBW, supplied to the input of the antenna for each carrier typeRequired if neither C.8.b.1 nor C.8.b.3.a is provided |  |  | **+** | **+** | **+** | **C** |  |  |  | C.8.a.1 |  |
| C.8.a.2 | the maximum power density, in dB(W/Hz), supplied to the input of the antenna for each carrier type2In the case of satellite networks or systems, required if neither C.8.b.2 nor C.8.b.3.b is providedIn the case of Appendix **30B**, required only for notification under Article **8**, or simultaneous submissions for entry into the List under § 6.17 and notification under § 8.1In the case of Appendix **30B** ESIM, required only for notification under Section B of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC-23)** (including simultaneous submissions for entry in the Appendix **30B** ESIM List and notification under Section A and Section B, respectively, of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC-23)**) |  |  | **+**  | **+** | **+** | **O** |  |  | **+** | C.8.a.2 |  |
| C.8.a.3 | the minimum power density, in dB(W/Hz), supplied to the input of the antenna for each carrier type2not required for Appendix **30B**In the case of Appendix **30B** ESIM, required only for notification under Section B of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC‑23)** (including simultaneous submissions for entry in the Appendix **30B** ESIM List and notification under Section A and Section B, respectively, of Part 1 to Annex 1 of draft new Resolution **[IAP-A115] (WRC‑23))** to be used for examination of the power flux density limits specified in Annex 2 of draft new Resolution **[IAP-A115] (WRC‑23)** |  |  |  |  |  |  |  |  | **+** | C.8.a.3 |  |
| C.8.b | **For the case where it is not appropriate to identify individual carriers:** |  |  |  |  |  |  |  |  |  | C.8.b |  |
| C.8.b.1 | the total peak envelope power, in dBW, supplied to the input of the antennaFor coordination or notification of an Appendix **30A** earth station the values shall include the maximum range of power controlIn the case of satellite networks or systems, required if neither C.8.a.1 nor C.8.b.3.a is provided |  |  | **+** | **+** | **+** |  **+ 1** | **X** | **X** |  | C.8.b.1 |  |
| C.8.b.2 | the maximum power density, in dB(W/Hz), supplied to the input of the antenna2For coordination or notification of an Appendix **30A** earth station the values shall include the maximum range of power controlIn the case of satellite networks or systems, required if neither C.8.a.2 nor C.8.b.3.b is providedIn the case of Appendix **30B**, required only for submission under Article 6In the case of Appendix **30B** ESIM, required only for submissions under Section A of Part 1 to Annex 1 of draft new Resolution **[IAP‑A115] (WRC‑23)** |  |  | **+** | **+** | **+** |  **+ 1** | **X** | **X**  | **+** | C.8.b.2 |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| C.8.h | the maximum power density per Hz supplied to the input of the antenna, in dB(W/Hz), averaged over the necessary bandwidth |  |  |  |  |  |  | **X** | **X** | **X** | C.8.h |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **C.10** | **TYPE AND IDENTITY OF THE ASSOCIATED STATION(S)***(the associated station may be another space station, a typical earth station of the network or system or a specific earth station)**For all space applications except active or passive sensors* |  | **C.10** |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| C.10.d | **For an associated earth station (whether specific or typical):** |  |  |  |  |  |  |  |  |  | C.10.d |  |
| C.10.d.1 | the class of station, using the symbols from the Preface |  |  | **X** | **X** | **X** |  |  |  |  | C.10.d.1 |  |
| C.10.d.2 | the nature of service performed, using the symbols from the Preface |  |  | **X** | **X** | **X** |  |  |  |  | C.10.d.2 |  |
| C.10.d.3 | the isotropic gain, in dBi, of the antenna in the direction of maximum radiation (see No. **1.160**) |  |  | **X** | **X** | **X** |  | **X** | **X** | **X** | C.10.d.3 |  |
| C.10.d.4 | the beamwidth, in degrees, between the half-power points (described in detail if not symmetrical) |  |  | **O** | **X** | **X** |  | **X** | **X** | **X** | C.10.d.4 |  |
| C.10.d.5.a | either the measured co-polar radiation pattern of the antenna or the co-polar reference radiation pattern |  |  | **X** | **X** | **X** |  | **X** | **X** | **X** | C.10.d.5.a |  |
| C.10.d.5.b | either the measured cross-polar radiation pattern of the antenna or the cross-polar reference radiation pattern |  |  |  |  |  |  | **X** | **X** |  | C.10.d.5.b |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| C.10.d.9 | antenna dimension aligned with the geostationary arc (*DGSO*), in metres (see the most recent version of Recommendation ITU‑R S.1855) Except for Appendix **30** or **30A** |  |  |  | **O** |  |  |  |  | **O** | C.10.d.9 |  |
| C.10.d.10 | the minimum elevation angle at which any associated Appendix **30B** ESIM can transmit to or receive from geostationary satellite not required for Appendix **30B**Required only for the notification of earth stations in motion submitted in accordance with draft new Resolution **[IAP‑A115] (WRC‑23)** |  |  |  |  |  |  |  |  | **+** | C.10.d.10 |  |
| **C.11** | **SERVICE AREA (S)***For all space applications except active or passive sensors* |  | **C.11** |  |
| C.11.a | the service area or areas of the satellite beam on the Earth, when the associated transmitting or receiving stations are earth stationsFor a space station submitted in accordance with Appendix **30**, **30A** or **30B**, the service area identified by a set of a maximum of 100 test points and by a service area contour on the surface of the Earth or defined by a minimum elevation angle*Note* – When an assignment converted from an allotment is reinstated in the Appendix **30B** Plan, the notifying administration may choose a maximum of 20 test points within its national territory for the reinstated allotment |  |  | **X** | **X** | **X** |  | **X** | **X** | **X** | C.11.a |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **C.12** | **REQUIRED PROTECTION RATIO** |  | **C.12** |  |
| C.12.a | if the aggregate carrier-to-interference ratio is less than 21 dB, the minimum acceptable aggregate carrier-to-interference ratio The carrier-to-interference ratio is to be expressed in terms of the power averaged over the necessary bandwidth of the modulated wanted and interfering signals, assuming both the desired carrier and interfering signals have equivalent bandwidths and modulation typesnot required for Appendix **30B** ESIM. |  |  |  |  |  |  |  |  | **+** | C.12.a |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |
| **C.15** | **DESCRIPTION OF THE GROUP(S) REQUIRED IN THE CASE OF NON-SIMULTANEOUS EMISSIONS** |  | **C.15** |  |
| C.15.a | if part of an exclusive operation group, the group identification code |  |  |  |  |  |  | **+** | **+** | **+** | C.15.a |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |

MOD IAP/44A15/7

**TABLE D**

OVERALL LINK CHARACTERISTICS      (Rev.WRC‑23)

| **Items in Appendix** | ***D \_ OVERALL LINK CHARACTERISTICS*** | **Advance publication of a geostationary-satellite network** | **Advance publication of a non-geostationary-satellite network or system subject to coordination under Section II of Article 9** | **Advance publication of a non-geostationary-satellite network or system 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 or system** | **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) or for Appendix 30B ESIM in accordance with draft new Resolution [IAP-A115] (WRC-23)** | **Items in Appendix** | **Radio astronomy** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *For non-planned services, this data may be provided by administrations that so desire but only when simple frequency-changing transponders are used on the space station onboard a geostationary satellite* |  |  |  |
| **D.1** | **CONNECTION BETWEEN EARTH-TO-SPACE AND SPACE-TO-EARTH FREQUENCIES IN THE NETWORK** |  | **D.1** |  |
| D.1.a | the connection between uplink and downlink frequency assignments for each intended combination of receiving and transmitting beamsIn the case of Appendix **30** or **30A**, required only for Region 2In the case of Appendix **30B**, required only for submission of both Earth-to-space and space-to-Earth links |  |  |  | **O** |  |  | **+** | **+** | **+** | D.1.a |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |

**Reasons:** New fields proposed to reflect the methodology contained in Annex 4 of Resolution **[IAP-A115] (WRC-23)**.

SUP IAP/44A15/8#1873

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)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. 1 The List of assignments for earth station in motion (ESIM) in the frequency band 12.75-13.25 GHz in Appendix **30B**. [↑](#footnote-ref-2)
2. 2 Submissions may include only the frequency band 12.75-13.0 GHz or 13.0-13.25 GHz. [↑](#footnote-ref-3)
3. 3 The “other provisions” shall be identified and included in the Rules of Procedure. [↑](#footnote-ref-4)
4. 4 The service area may be reduced by excluding certain countries for which explicit agreement was obtained. [↑](#footnote-ref-5)
5. 5 Submissions may include only the frequency band 12.75-13.0 GHz or 13.0-13.25 GHz. [↑](#footnote-ref-6)
6. 6 The “other provisions” shall be identified and included in the Rules of Procedure. [↑](#footnote-ref-7)
7. 7 Similar course of action as prescribed in footnote 7*bis* of § 6.21 of Article 6 of Appendix 30B applies. [↑](#footnote-ref-8)
8. 8 The “other provisions” shall be identified and included in the Rules of Procedure. [↑](#footnote-ref-9)
9. 9 When an administration notifies any assignment with characteristics different from those entered in the Appendix **30B** ESIM List through successful application of the relevant procedure of Section A and Part II of this Annex, the Bureau shall undertake calculation to determine if the proposed new characteristics increase the interference level caused to other allotments in the Plan, assignments in the List, an assignment for which the Bureau has received complete information in accordance with § 6.1 of Article 6 of Appendix **30B** before the date of receipt of this notification, assignments in the Appendix **30B** ESIM List and an assignment for which the Bureau has received complete information in accordance with § 1 of Section A before the date of receipt of this notification. The increase of the interference due to characteristics different from those entered in the Appendix **30B** ESIM List will be checked by comparing the *C*/*I* ratios of these other allotments and assignments, which result from the use of the proposed new characteristics of the subject assignment on the one hand, and those obtained with the characteristics of the subject assignment in the Appendix **30B** ESIM List, on the other hand. This *C*/*I* calculation is performed under the same technical assumptions and conditions. [↑](#footnote-ref-10)
10. 10 The fourth altitude value (*H4*) computed in accordance with this *Hstep* is adjusted to 2.99 km to facilitate the examination of compliance with the two sets of predefined pfd values indicated in Tables 5A and 5B. [↑](#footnote-ref-11)
11. 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-12)