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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 16 to Document 65-E** | |
|  | | **30 October 2023** | |
|  | | **Original: English** | |
|  | | | |
| European Common Proposals | | | |
| PROPOSALS FOR THE WORK OF THE CONFERENCE | | | |
|  | | | |
| Agenda item 1.16 | | | |

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

Introduction

This document proposes modifications to the Radio Regulations to facilitate the use of the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by ESIMs communicating with non-GSO FSS satellite networks while protecting services allocated in those frequency bands and in adjacent frequency bands.

The following regulatory measures are proposed:

– To add a new footnote in RR Article **5** with reference to a new WRC-23 Resolution providing the conditions for the operation of non-GSO ESIMs and for the protection of existing services.

– To ensure that non-GSO ESIM characteristics shall remain within the envelope characteristics of typical earth stations associated with the non-GSO satellite system with which it communicates. In addition, the operation of non-GSO ESIM shall comply with the coordination agreements obtained following the application of provisions under RR No. **9.11A**. These conditions address the compatibility with GSO FSS networks in frequency bands where epfd limits do not apply.

– To address compatibility with GSO FSS networks operating in the frequency bands 17.8-18.6 GHz, 19.7-20.2 GHz, 27.5-28.6 GHz and 29.5-30 GHz, it is proposed that links involving non-GSO ESIM shall comply with epfd limits in RR Nos. **22.5C**, **22.5D**, **22.5F** and in RR Table **22-4B**.

– Regarding sharing with fixed and mobile services in the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz, this document proposes that non-GSO ESIM operating in the same frequency bands (space-to-Earth) shall not claim protection from terrestrial stations.

– To address the protection of fixed and mobile services in the frequency bands 27.5-29.1 GHz and 29.5-30 GHz for administrations mentioned in RR No. **5.542** from aeronautical ESIMs, it is proposed to apply power flux-density (pfd) limits on the Earth’s surface. With respect to maritime ESIMs, this document proposes a minimum distance from the coastal State beyond which maritime ESIMs can operate without the prior agreement and also a maximum e.i.r.p. spectral density towards the territory of the coastal State.

– To address compatibility with EESS (passive) in the frequency band 18.6-18.8 GHz, it is proposed to apply the limits to unwanted emission power flux-density at the surface of the oceans produced by the FSS satellites with which non-GSO ESIM communicate.

– This document proposes that the frequency assignments used for the operations of non‑GSO ESIMs shall be notified by the notifying administration of the FSS satellite system with which the ESIM communicate. In addition, the notifying administration ensures that non-GSO ESIMs operate in the territories under the jurisdiction of any administration from which an authorization has been obtained.

The attachment to this ECP is provided for information only. The content is not proposed for inclusion, either totally or partially, in the new Resolution **[EUR-A116-NGSO-ESIM]** **(WRC-23)**.

Proposals

ARTICLE 5

Frequency allocations

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

MOD EUR/65A16/1#1880

15.4-18.4 GHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 17.7-18.1  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.517A ADD 5.A116 (Earth-to-space) 5.516  MOBILE | 17.7-17.8  FIXED  FIXED-SATELLITE (space-to-Earth) 5.517 5.517A ADD 5.A116 (Earth-to-space) 5.516  BROADCASTING-SATELLITE  Mobile  5.515 | 17.7-18.1  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.517A ADD 5.A116 (Earth-to-space) 5.516  MOBILE |
|  | 17.8-18.1  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.517A ADD 5.A116 (Earth-to-space) 5.516  MOBILE  5.519 |  |
| 18.1-18.4 FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B 5.517A ADD 5.A116 (Earth-to-space) 5.520  MOBILE  5.519 5.521 | | |

MOD EUR/65A16/2#1881

18.4-22 GHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Allocation to services | | | | |
| Region 1 | Region 2 | | Region 3 | |
| 18.4-18.6 FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B 5.517A ADD 5.A116  MOBILE | | | | |
| … |  | |  | |
| 18.8-19.3 FIXED  FIXED-SATELLITE (space-to-Earth) 5.516B 5.517A 5.523A ADD 5.A116  MOBILE | | | | |
| … | | | | |
| 19.7-20.1  FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A ADD 5.A116  Mobile-satellite (space-to-Earth) | | 19.7-20.1  FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A ADD 5.A116  MOBILE-SATELLITE (space-to-Earth) | | 19.7-20.1  FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A ADD 5.A116  Mobile-satellite (space-to-Earth) |
| 5.524 | | 5.524 5.525 5.526 5.527 5.528 5.529 | | 5.524 |
| 20.1-20.2FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A ADD 5.A116  MOBILE-SATELLITE (space-to-Earth)  5.524 5.525 5.526 5.527 5.528 | | | | |

MOD EUR/65A16/3#1882

24.75-29.9 GHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 27.5-28.5 FIXED 5.537A  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.517A 5.539 ADD 5.A116  MOBILE  5.538 5.540 | | |
| 28.5-29.1 FIXED  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.517A 5.523A 5.539 ADD 5.A116  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540 | | |
| … | | |
| 29.5-29.9  FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.527A 5.539 ADD 5.A116  Earth exploration-satellite (Earth-to-space) 5.541  Mobile-satellite (Earth-to-space) | 29.5-29.9  FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.527A 5.539 ADD 5.A116  MOBILE-SATELLITE (Earth-to-space)  Earth exploration-satellite (Earth-to-space) 5.541 | 29.5-29.9  FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.527A 5.539 ADD 5.A116  Earth exploration-satellite (Earth-to-space) 5.541  Mobile-satellite (Earth-to-space) |
| 5.540 5.542 | 5.525 5.526 5.527 5.529 5.540 | 5.540 5.542 |

MOD EUR/65A16/4#1883

29.9-34.2 GHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 29.9-30 FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.527A 5.539 ADD 5.A116  MOBILE-SATELLITE (Earth-to-space)  Earth exploration-satellite (Earth-to-space) 5.541 5.543  5.525 5.526 5.527 5.538 5.540 5.542 | | |

ADD EUR/65A16/5#1884

5.A116The operation of earth stations in motion communicating with non-geostationary space stations in the fixed-satellite service in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) shall be subject to the application of Resolution **[EUR-A116-NGSO-ESIM] (WRC‑23)**.     (WRC‑23)

ADD EUR/65A16/6#1885

draft new RESOLUTION [EUR-A116-NGSO-ESIM] (WRC‑23)

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

The World Radiocommunication Conference (Dubai, 2023),

considering

*a)* that there is a need for global broadband mobile satellite communications, and that some of this need could be met by allowing earth stations in motion (ESIMs) to communicate with space stations of the non-geostationary-satellite orbit (non-GSO) fixed-satellite service (FSS) operating in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth), and 27.5-29.1 GHz and 29.5-30.0 GHz (Earth-to-space);

*b)* that the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) are allocated to space services, and the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz, and 27.5-29.1 GHz are allocated to terrestrial services on a primary basis worldwide; in the countries identified in No. **5.524** of the Radio Regulations, the frequency band 19.7-20.2 GHz is allocated to the fixed and mobile services on a primary basis; and, in the countries identified in No. **5.542** of the Radio Regulations, the frequency band 29.5-30 GHz is allocated to the fixed and mobile services on a secondary basis, and used by a variety of different systems and these existing services and their future development need to be protected, without any additional constraints, from the operation of non-GSO ESIMs;

*c)* that the frequency band 18.6-18.8 GHz is allocated to the Earth exploration-satellite service (EESS) (passive) and space research service (SRS) (passive) and that these services need to be protected from operation of non-GSO FSS in the space-to-Earth direction;

*d)* that there is no specific regulatory procedure for the coordination of non-GSO ESIMs relative to terrestrial stations for these services since the frequency bands 17.7-18.6 GHz, 18.8‑19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) are not allocated for the operation of non-GSO ESIMs;

*e)* that regulatory procedures and interference-management mechanisms, including necessary mitigation measures, are required for the operation of non-GSO ESIMs to protect other space and terrestrial services allocated in the frequency bands mentioned in *considering a)*,

considering further

*a)* that aeronautical and maritime ESIMs operating within the service area of the non-GSO FSS systems with which they communicate may provide service within the territories under the jurisdiction of multiple administrations;

*b)* that this Resolution does not establish any technical or regulatory provisions for the operation and use of land ESIMs communicating with non-GSO FSS space stations, and any authorization of land ESIMs remains strictly a national matter, taking also into account the need to avoid cross-border interference,

recognizing

*a)* that the administration authorizing non-GSO ESIMs on the territory under its jurisdiction has the right to require that non-GSO ESIMs referred to above only use those assignments associated with non-GSO FSS systems which have been successfully coordinated, notified, brought into use and recorded in the Master International Frequency Register (MIFR) with a favourable finding under Articles **9** and **11**, including Nos. **11.31**, **11.32** or **11.32A**, where applicable;

*b)* that the provisions of No. **22.2** apply to non-GSO FSS satellite systems with which ESIMs operate in the frequency band 17.7-17.8 GHz (space-to-Earth) with respect to GSO FSS and GSO BSS networks;

*c)* that, under the provisions of No. **22.2**, non-GSO ESIMs in the frequency bands 17.8-18.6 GHz and 19.7-20.2 GHz shall not claim protection from GSO FSS and GSO BSS networks operating in accordance with these Regulations, and non-GSO ESIMs in the frequency bands 27.5-28.6 GHz and 29.5-30 GHz shall not cause unacceptable interference to, or claim protection from, GSO FSS networks operating in accordance with the Radio Regulations, and No. **5.43A** does not apply in this case;

*d)* that there is no obligation for administration to authorize/license any non-GSO ESIMs to operate within the territory under its jurisdiction;

*e)* that, for the implementation of the relevant parts of *resolves* 1.1.2 below, a non-GSO FSS system operating in the frequency bands 17.8-18.6 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-28.6 GHz and 29.5-30 GHz (Earth-to-space) in compliance with the epfd limits referred to in Nos. **22.5C**, **22.5D** and **22.5F** is considered as having fulfilled its obligations under No. **22.2** with respect to any geostationary-satellite network, provided that the operational limits given in Table **22-4B** are met by the non-GSO FSS system;

*f)* that, with respect to GSO FSS networks, in the frequency bands 18.8-19.3 GHz (space-to-Earth) and 28.6-29.1 GHz (Earth-to-space) Nos. **9.12A** and **9.13** apply, and No. **22.2** does not apply;

*g)* that, for the use of the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7‑20.2 GHz (space-to-Earth) and 27.5‑29.1 GHz and 29.5-30 GHz (Earth-to-space) by non-GSO FSS systems, No. **9.12** applies;

*h*) that affected administrations retain their right to directly contact the responsible entity for the aircraft or vessel or directly the vessel on which the ESIM operates,

recognizing further

*a)* that frequency assignments to non-GSO ESIMs need to be notified to the Radiocommunication Bureau (BR);

*b)* that the notification by different administrations of frequency assignments to be used by the same non-GSO satellite system may create difficulties to identify the responsible administration in case of unacceptable interference;

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

resolves

1 that, for any aeronautical or maritime ESIM communicating with non-GSO FSS space stations in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5‑29.1 GHz and 29.5-30 GHz (Earth-to-space), or parts thereof, the following conditions shall apply:

1.1 with respect to space services in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz, 19.7-20.2 GHz (space-to-Earth), and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space), and in their adjacent bands in the frequency band 18.6-18.8 GHz, non-GSO ESIMs shall comply with the following conditions:

1.1.1 to prevent potential interference with respect to satellite networks or systems of other administrations, non-GSO ESIMs characteristics shall remain within the envelope characteristics of typical earth stations associated with the non-GSO FSS system with which these ESIMs communicate;

1.1.1.1 for the implementation of *resolves* 1.1.1, the notifying administration for the non-GSO FSS system with which the non-GSO ESIMs communicate shall, in accordance with this Resolution, send to the BR Appendix **4** notification information related to the characteristics of the non-GSO ESIMs intended to communicate with that non-GSO FSS system, together with the commitment that the operation shall be in conformity with the Radio Regulations, including this Resolution;

1.1.1.2 upon receipt of the notification information referred to in *resolves* 1.1.1.1, the Bureau shall examine it with respect to the provisions referred to in *resolves* 1.1.1, including the commitment referred to in *resolves* 1.1.1.1, and publish the result of such examination in the International Frequency Information Circular (BR IFIC);

1.1.2 the notifying administration of the non-GSO FSS system with which the ESIMs communicate shall ensure that the operation of ESIMs complies with the coordination agreements for the frequency assignments of the typical earth station of this non-GSO FSS system obtained under the provisions of Article **9** of the Radio Regulations;

1.1.3 the notifying administration of the non-GSO FSS system with which the ESIMs communicate shall ensure that non-GSO ESIMs comply with the epfd limits referred to in Nos. **22.5C**, **22.5D,** **22.5F** and **22.5I** for the protection of GSO FSS networks operating in the frequency bands 17.8-18.6 GHz, 19.7-20.2 GHz (space-to-Earth), 27.5‑28.6 GHz and 29.5-30 GHz (Earth-to-space) (see *recognizing e)*);

1.1.4 non-GSO ESIMs shall not claim protection from earth stations of the FSS (Earth-to-space) used for feeder links of the BSS operating in accordance with the Radio Regulations in the frequency band 17.7‑18.4 GHz;

1.1.5 with respect to protection of EESS (passive) operating in the frequency band 18.6‑18.8 GHz, any non-GSO FSS systems, with an orbital apogee of less than 20 000 km operating in the frequency bands 18.3-18.6 GHz and 18.8-19.1 GHz with which aeronautical and/or maritime ESIMs communicate and for which the complete notification information has been received by the BR after 1 January 2025 shall comply with the provisions indicated in Annex 3 to this Resolution;

1.1.6 for the implementation of *resolves*1.1.5 above, the notifying administration for the non-GSO FSS system with which the non-GSO ESIMs communicate shall send to the BR the relevant Appendix **4** notification information including the commitment that the operation shall be in conformity with *resolves*1.1.5;

1.2 with respect to terrestrial services in the frequency bands 17.7‑18.6 GHz, 18.8-19.3 GHz, 19.7-20.2 GHz, 27.5-29.1 GHz and 29.5-30 GHz, non-GSO ESIMs shall comply with the following conditions:

1.2.1 receiving non-GSO ESIMs in the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (see No. **5.524**) shall not claim protection from assignments in the terrestrial services to which those frequency bands are allocated and that operate in accordance with the Radio Regulations;

1.2.2 transmitting non-GSO ESIMs in the frequency band 27.5-29.1 GHz shall not cause unacceptable interference to terrestrial services to which the frequency band is allocated and that operate in accordance with the Radio Regulations, and Annex 1 to this Resolution shall apply;

1.2.3 transmitting non-GSO ESIMs in the frequency band 29.5-30.0 GHz shall not adversely affect the operations of terrestrial services to which this frequency band is allocated on a secondary basis and that operate in accordance with the Radio Regulations, and limits in Annex 1 to this Resolution shall apply with respect to administrations mentioned in No. **5.542**;

1.2.4 the provisions in this Resolution, including Annex 1, set the conditions for the purpose of protecting terrestrial services from unacceptable interference from non-GSO ESIMs in countries other than that under the jurisdiction of which ESIMs operate, in accordance with the provisions included in *resolves* 1.2.2 and 1.2.3 above in the frequency band 27.5-29.1 GHz and in the frequency band 29.5‑30.0 GHz with respect to administrations mentioned in No. **5.542**; however, the requirement not to cause unacceptable interference to, or claim protection from, terrestrial services to which the frequency bands are allocated and operating in accordance with the Radio Regulations remains valid (see *resolves further* 5);

1.2.5 the Bureau shall examine, in accordance with the provisions included in *resolves* 1.2.2 and 1.2.3 and with the methodology in Annex 2, the characteristics of aeronautical non‑GSO ESIMs with respect to the conformity with the power flux-density (pfd) limits on the Earth’s surface specified in Part 2 of Annex 1 to this Resolution and publish the results of such examination in the BR IFIC;

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

1.3.1 only the notifying administration of the non-GSO FSS system with which ESIMs communicate is responsible for resolving the case of unacceptable interference;

1.3.2 the notifying administration of the non-GSO FSS system with which the ESIMs communicate shall immediately take the required actions to eliminate or reduce interference to an acceptable level;

1.3.3 the affected administration(s) may assist resolving or provide information that would facilitate resolving the case of unacceptable interference;

1.3.4 the administration authorizing the operation of A-ESIM and M-ESIM on the territory under its jurisdiction shall, to the extent of its ability, cooperate to assist in the resolution of unacceptable interference, including providing information as necessary;

1.3.5 the administration responsible for the aircraft or vessel on which the ESIM operates shall provide a point of contact to assist identifying the notifying administration of the satellite with which the ESIM communicates;

1.4 that the notifying administration of non-GSO FSS satellite system with which ESIMs communicate shall ensure that:

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

1.4.2 all necessary measures shall be taken so that earth stations on aircraft and vessels are subject to permanent monitoring and control by a Network Control and Monitoring Centre (NCMC) 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;

1.4.3 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 has not authorized its use;

1.4.4 the notifying administration of the non-GSO FSS system with which ESIMs communicate shall provide a permanent point of contact in the Appendix **4** submission and this shall be published in the relative special section of the BR IFIC for the purpose of tracing any suspected cases of unacceptable interference from A‑ESIMs or M‑ESIMs and for the purpose of immediately responding to the relevant requests;

2 that non-GSO ESIMs shall not be used or relied upon for safety-of-life applications;

3 that the operation of non-GSO ESIMs within the territory, including territorial waters and airspace, under the jurisdiction of any administration shall be carried out only if an authorization or a licence according to No. **18.1** from that administration is obtained;

4 that the notifying administrations of those non-GSO FSS systems with which non-GSO ESIMs in the frequency bands in *considering a)* above are intended to operate shall submit a commitment to the Bureau to immediately act to eliminate or reduce the interference to an acceptable level upon receiving a report of unacceptable interference (see *resolves* 1.3.2 and *resolves further* 4);

5 in case there are more than one administration involved in the notification of frequency assignments of the same non-GSO satellite system with which ESIMs communicate, all those administrations shall be responsible to eliminate any unacceptable interference cases;

6 that the application of this Resolution does not provide regulatory status to non-GSO ESIMs different from that derived from the non-GSO FSS satellite system with which they communicate, taking into account the provisions referred to in this Resolution (see *recognizing b)*);

7 that any course of action taken under this Resolution has no impact on the original date of receipt of the frequency assignments of the non-GSO FSS satellite system with which non-GSO ESIMs communicate or on the coordination requirements of that satellite system,

resolves further

1 that ESIMs shall not cause unacceptable interference to nor claim protection from other services as referred in *recognizing c)* and in *resolves*1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.2.1, 1.2.2 and 1.2.4;

2 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*4) that, upon receiving a report of unacceptable interference, the notifying administration for the non-GSO system with which ESIMs communicate shall remove such interference;

3 that the commitment referred to in *resolves further*2 shall be objective, measurable and enforceable;

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

5 that compliance with the provisions contained in Annex 1 does not release the notifying administration of the non-GSO satellite system with which ESIMs communicate of its obligations mentioned in *resolves further*1;

6 that frequency assignments to ESIMs shall be notified by the notifying administration of the non-GSO satellite system in the FSS with which ESIMs communicate;

7 that, the notifying administration of the satellite system shall ensure that non-GSO ESIMs operate only in the territory under the jurisdiction of administrations from which an authorization has been obtained, taking into account *recognizing further c)*;

8 that, for the implementation of *resolves further* 1, the notifying administration responsible for the operation of aeronautical and maritime non-GSO ESIMs shall also be responsible for observing and complying with all relevant regulatory and administrative provisions applicable to the operation of the ESIMs as included in this Resolution and those contained in the Radio Regulations;

9 that the authorization to non-GSO ESIM to operate in the territory under the jurisdiction of an administration shall in no way release the notifying administration of the non-GSO satellite system with which the non-GSO ESIM communicates from the obligation to comply with the provisions included in this Resolution and those contained in the Radio Regulations;

10 that, should an administration authorizing aeronautical and/or maritime non-GSO ESIMs agree to less stringent limits than those contained Annex 1 within the territory under its jurisdiction, such agreement shall not affect other countries that are not party to that agreement,

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 aeronautical and maritime non-GSO ESIMs have been properly addressed;

3 not to examine, under No. **11.31**, the conformity of non-GSO FSS systems with the provisions of *resolves*1.1.5 of this Resolution;

4 to publish the list of non-GSO satellite systems for which non-GSO ESIM characteristics have been submitted according to *resolves* 1.1.1.1 including the associated service areas; this information shall be updated regularly;

5 to provide assistance to administrations in the case where an administration has difficulty in identifying a source of unacceptable interference,

instructs the Secretary-General

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 [EUR-A116-NGSO-ESIM] (WRC‑23)

Provisions for maritime and aeronautical non-GSO ESIMs to protect terrestrial services operating in the frequency band 27.5-29.1 GHz and for the frequency band 29.5-30.0 GHz with respect to administrations mentioned   
in No. 5.542

The parts below contain provisions to ensure that maritime and aeronautical non-GSO ESIMs do not cause unacceptable interference in neighbouring countries to terrestrial service operations when non‑GSO ESIMs operate in frequencies overlapping with those used by terrestrial services at any time to which the frequency band 27.5-29.1 GHz is allocated and operating in accordance with the Radio Regulations. The provisions below also apply for the operation of the non‑GSO ESIMs in the frequency band 29.5-30 GHz with respect to administrations mentioned in No. **5.542** (see *resolves* 1.2.2 and 1.2.3).

Part 1: Maritime non-GSO ESIMs

1 The notifying administration of the non-GSO FSS satellite system with which maritime ESIMs communicates shall ensure compliance of the maritime ESIMs with both of the following conditions for the protection of terrestrial services to which the frequency band is allocated within a coastal State:

1.1 The minimum distance from the low-water mark as officially recognized by the coastal State beyond which maritime ESIMs can operate without prior agreement is 70 km. Any transmissions from maritime ESIMs within the minimum distance shall be subject to the prior agreement of the coastal State(s) concerned.

1.2 The maximum maritime ESIMs e.i.r.p. spectral density towards the territory of any coastal State shall be limited to 24.44 dBW in a reference bandwidth of 14 MHz. Transmissions from maritime ESIMs 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(s) concerned.

Part 2: Aeronautical non-GSO ESIMs

2 The notifying administration of the non-GSO FSS satellite system with which aeronautical ESIMs communicates shall ensure compliance of the aeronautical ESIMs with all of the following conditions for the protection of the terrestrial services to which the frequency band is allocated:

2.1 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 aeronautical ESIM shall not exceed:

pfd(θ) = −124.7 (dB(W/(m2 ∙ 14 MHz))) for 0° ≤ θ ≤ 0.01°

pfd(θ) = −120.9 + 1.9 ∙ logθ (dB(W/(m2 ∙ 14 MHz))) for 0.01° < θ ≤ 0.3°

pfd(θ) = −116.2 + 11 ∙ logθ (dB(W/(m2 ∙ 14 MHz))) for 0.3° < θ ≤ 1°

pfd(θ) = −116.2 + 18 ∙ logθ (dB(W/(m2 ∙ 14 MHz))) for 1° < θ ≤ 2°

pfd(θ) = −117.9 + 23.7 ∙ logθ (dB(W/(m2 ∙ 14 MHz))) for 2° < θ ≤ 8°

pfd(θ) = −96.5 (dB(W/(m2 ∙ 14 MHz))) for 8° < θ ≤ 90.0°

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

2.2 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) = −136.2 (dB(W/(m2 ∙ 1 MHz))) for 0° ≤ θ ≤ 0.01°

pfd(θ) = −132.4 + 1.9 ∙ logθ (dB(W/(m2 ∙ 1 MHz))) for 0.01° < θ ≤ 0.3°

pfd(θ) = −127.7 + 11 ∙ logθ (dB(W/(m2 ∙ 1 MHz))) for 0.3° < θ ≤ 1°

pfd(θ) = −127.7 + 18 ∙ logθ (dB(W/(m2 ∙ 1 MHz))) for 1° < θ ≤ 12.4°

pfd(θ) = −108 (dB(W/(m2 ∙ 1 MHz))) for 12.4° < θ ≤ 90°

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

2.3 Higher pfd levels than those provided in §§ 2.1 and 2.2 above produced by aeronautical non-GSO ESIMs on the surface of the Earth within an administration shall be subject to the prior agreement of that administration.

Annex 2 to draft new Resolution [EUR-A116-NGSO-ESIM] (WRC‑23)

Methodology and procedure to examine the pfd on the Earth’s surface produced by A-ESIM communicating with non-GSO FSS satellites   
and the conformity with pfd limits

# 1 A-ESIM parameters required for the examination

To conduct the relevant examination of A-ESIM and their conformity with respect to the pfd limits in Part 2 of Annex 1, the following parameters are required:

‒ Satellite system name;

‒ A-ESIM peak antenna gain;

‒ 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.

# 2 Examination methodology

## 2.1 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 non-GSO FSS satellite system 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 non-GSO FSS satellite system 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.

2.2 Parameters and Geometry

Considering a hypothetical non-GSO FSS system, Table 1 below provides an example of emissions that are included in one Group associated to the A-ESIM non-GSO FSS class of earth station transmitting in the 27.5-29.1 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 Appendix 4 data fields)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Emission n. | C.7.a Designation of emission | *BWemission* MHz | C.8.c.3 minimum power density  dB(W/Hz) | C.8.a.2/C.8.b.2 Maximum power density  dB(W/Hz) |
| 1 | 6M00G7W-- | 6.0 | −69.7 | −66.0 |
| 2 | 6M00G7W-- | 6.0 | −64.7 | −61.0 |
| 3 | 6M00G7W-- | 6.0 | −59.7 | −56.0 |

TABLE 2

Additional example assumptions

| ID | Parameter | Notation | Value | Unit |
| --- | --- | --- | --- | --- |
| 1 | Frequency assignment | *f* | 29.1 | 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* | 37.5 | 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 non-GSO FSS system | *ε* | Maximum of (10°, Minimum elevation angle A.4.b.7.c*bis*) | ° |
| 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 |  | Specified by the pre-established sets of pfd limits in Part 2 of Annex 1, 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[[1]](#footnote-1) | *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 ESIMs altitudes

Diagram

Description automatically generated

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° |

Note: 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)

2.3 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 angle 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:

 (1)

where 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:

 (2)

*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 *Gtx*(γ*j,n* + ε) 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 in Part 2 of Annex 1, 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 5 below:

TABLE 5

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*

For the operation of emission bandwidth smaller than the reference bandwidth, this methodology is applicable provided that the notifying administration confirms that A-ESIM operates only one emission within the reference bandwidth. If there is no such confirmation, this methodology is not applicable.

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



The results of this check are illustrated in Table 6 below.

TABLE 6

Example comparison between *Pj* and (*P*min\_*emission,j*; *P*max\_*emission,j*)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Emission n. | C.7.a Designation of emission | *BWemission* MHz | C.8.c.3 minimum power density  dB(W/Hz) | C.8.a.2/C.8.b.2 Maximum power density  dB(W/Hz) | Lowest altitude *Hj* (km) for which *P*max\_*emission,j >Pj>   P*min\_*emission,j* |
| 1 | 6M00G7W-- | 6.0 | −69.7 | −66.0 | *TBD* |
| 2 | 6M00G7W-- | 6.0 | −64.7 | −61.0 | *TBD* |
| 3 | 6M00G7W-- | 6.0 | −59.7 | −56.0 | *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 5;

– 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***

Annex 3 to draft new Resolution [EUR-A116-NGSO-ESIM] (WRC‑23)

Provisions for non-GSO FSS systems[[2]](#footnote-2)2 transmitting to aeronautical and/or maritime ESIMs operating in or over an ocean in the frequency bands   
18.3-18.6 GHz and 18.8-19.1 GHz with respect to EESS (passive)   
operating in the frequency band 18.6-18.8 GHz   
(in accordance with *resolves* 1.1.6)

Non-GSO space stations operating with an orbit apogee of more than 2 000 km and less than 20 000 km in the frequency bands 18.3-18.6 GHz and 18.8-19.1 GHz when communicating with aeronautical or maritime ESIM shall not exceed a power flux-density produced at the surface of the oceans across the 200 MHz of the 18.6-18.8 GHz band, of −118 dB(W/(m² · 200 MHz)).

Non-GSO space stations operating with an orbit apogee less than or equal to 2 000 km in the frequency bands 18.3-18.6 GHz and 18.8-19.1 GHz when communicating with aeronautical or maritime ESIM shall not exceed a power flux-density produced at the surface of the oceans across the 200 MHz of the 18.6-18.8 GHz band, of −110 dB(W/(m² · 200 MHz)).

**Reasons:** The *instructs the Director of the Radiocommunication Bureau* 4 above corresponds to Option 2 of the *instructs the Director of the Radiocommunication Bureau* 5 in the draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC-23)** included in the CPM Report. CEPT believes that Option 2 is preferable to Option 1 because some administration may find difficulties to provide the Bureau with the information requested to be published under that option as explained here below:

i) There is no standard “authorization”, since the authorization process is specific to each administration, depends on the terminal type and can cover multiple licenses/authorizations provided to different entities. Therefore, identifying which information should be provided to the Bureau may be challenging for some administrations.

ii) Some authorizing administrations do not make information on licenses/authorizations available to the public and, hence, it may not be possible for those administrations to provide such confidential information to the BR for publication in the BR IFIC.

iii) The information proposed to be provided could represent additional burden to the authorizing administration that would need to entertain additional and possibly regular (depending on the license validity period) exchanges with the notifying administration or the BR.

Furthermore, even if the publication of the list of countries authorizing the use of non-GSO ESIM on the territory under their jurisdiction were possible, making such information available would not be effective to identify the notifying administration and/or the ESIM causing unacceptable interference. This is due to the following reasons:

i) It is likely that the non-GSO systems supporting the operation of non-GSO ESIM would seek authorizations from the same administrations and respective markets. Therefore, the information published in the BR IFIC would likely be in the form of ESIMs from all operators being authorized in the same countries. Because of such generality, the availability of such information would be unlikely to help identifying the ESIM causing unacceptable interference.

ii) The unacceptable interference could be coming from a non-GSO ESIM operating in international airspace/waters and for which no country would authorize its operation.

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 stations2    (Rev.WRC‑12)

Footnotes to Tables A, B, C and D

MOD EUR/65A16/7#1886

**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)** | **Items in Appendix** | **Radio astronomy** |
| … | … | … | … | … | … | … | … | … | … | … | … | … |
| **A.24** | **COMPLIANCE WITH NOTIFICATION OF A NON-GSO SHORT DURATION MISSION** |  | | | | | | | | | **A.24** |  |
| A.24.a | a commitment by the administration that, in the case that unacceptable interference caused by a non-GSO satellite network or system identified as short-duration mission in accordance with Resolution **32 (WRC‑19)** is not resolved, the administration shall undertake steps to eliminate the interference or reduce it to an acceptable level  Required only for notification |  |  |  |  | **+** |  |  |  |  | A.24.a |  |
| **A.25** | **COMPLIANCE WITH *resolves* 1.1.1.1 OF DRAFT NEW RESOLUTION [EUR-A116-NGSO-ESIM]** **(WRC‑23)** |  | | | | | | | | | **A.25** |  |
| A.25.a | a commitment that the ESIM operation would be in conformity with the Radio Regulations and draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC‑23)**  Required only for the notification of earth stations in motion submitted in accordance with draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC‑23)** |  |  |  |  | **+** |  |  |  |  | A.25.a |  |
| **A.26** | **COMPLIANCE WITH *resolves* 4 and *resolves* *further* 2 OF DRAFT NEW RESOLUTION [EUR-A116-NGSO-ESIM]** **(WRC**‑**23)** |  | | | | | | | | | **A.26** |  |
| A.26.a | a commitment that, upon receiving a report of unacceptable interference, the notifying administration for the non-GSO FSS network with which ESIMs communicate shall follow the procedures in *resolves*1.3 of draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC‑23)**  Required only for the notification of earth stations in motion submitted in accordance with draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC‑23)** |  |  |  |  | **+** |  |  |  |  | A.26.a |  |
| **A.27** | **COMPLIANCE WITH *resolves* 1.1.6 OF DRAFT NEW RESOLUTION [EUR-A116-NGSO-ESIM]** **(WRC‑23)** |  | | | | | | | | | **A.27** |  |
| A.27.a | a commitment by the notifying administration for a non-GSO FSS system with an orbital apogee of less than 20 000 km communicating with ESIM in the frequency bands 18.3-18.6 GHz and 18.8-19.1 GHz that the pfd in the band 18.6-18.8 GHz shall be in conformity with the pfd limits on the Earth’s surface specified in Annex 3 to draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC‑23)**  Required only for the notification of non-GSO space stations submitted in accordance with draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC‑23))** |  |  |  |  | **+** |  |  |  |  | A.2**7**.a |  |
| … | … | … | … | … | **…** | … | … | … | … | … | … | … |

ATTACHMENT

Complementary information about an example implementation of a Network Control and Monitoring Centre and its role in controlling   
the operations of ESIM

The content of this attachment is for information only. The content is complementary to the information already provided in Document 4A/754, and it is not proposed for inclusion either totally or partially, in the draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC-23)**.

# 1 Introduction

This document provides a description of an example implementation of the Network Control and Monitoring Centre (NCMC) as well as some of its functionalities that may be used to address cases of unacceptable interference generated by ESIM.

# 2 The role of the Network Control and Monitoring Centre (NCMC) and its functionalities in an example implementation of it

All user terminals in non-GSO systems, including ESIM, are subject to permanent monitoring and control by a NCMC and are capable of receiving and acting upon “enable transmission” and “disable transmission” commands from the NCMC.

The NCMC is responsible for the system configuration, control, monitoring, alarming, and reporting of all devices on the entire system. In particular, the NCMC monitors and controls the operation of any ESIM and is able to determine whether the ESIM is malfunctioning. For example, the NCMC could limit the transmission in case an ESIM would not be able to point correctly to the wanted satellite during its operation.

This section provides a general overview of the functionalities of an example implementation of the NCMC. Since hardware and software characteristics of NCMC are case-specific, those requirements should not be part of the draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC‑23)** so that the ITU does not advocate for a particular implementation of NCMC functions.

## 2.1 Database of regulatory, technical and operational requirements

In the example implementation considered here, the NCMC works in association with a database of regulatory, technical and operational requirements to which all user terminals, including ESIM, are subject. This database includes the list of administrations that granted authorizations to ESIM to operate on the territories under their jurisdiction. The information in that database also includes the e.i.r.p. and power spectral density limits allowed for maritime and aeronautical ESIM in order to comply with the provisions of the draft new Resolution**[EUR-A116-NGSO-ESIM] (WRC-23)**, as well as the specific local regulatory requirements, which can be more or less stringent than those provisions.

This database is regularly updated to capture any change, for example evolution of the list of countries that authorized the operation of ESIM and the associated provisions.

## 2.2 Timing elements associated to changes of ESIM configuration

In the example implementation considered here, it is worth noting that, for each ESIM, the NCMC has real-time access to its latitude, longitude, altitude (in case of A-ESIM), transmit power, transmit frequency and channel bandwidth. In particular, bandwidth and power can be allocated to each ESIM in a process governed by the NCMC based on demand and local regulatory requirements, which ensures compliance in a given country/geographical area. In other words, thanks to this bi‑directional exchange of “signalling information” between the NCMC and ESIM, the NCMC can limit the operation of ESIM only to the territories under the jurisdiction of those countries that have authorized their use. This applies also to scenarios in which an aircraft flies at high speed over a territory where the borders of countries are close to each other. In fact, in general, signalling information is exchanged between the ESIM and the NCMC with a duty cycle that does not exceeds **a few milliseconds**. Such a short duty cycle allows A-ESIM and M-ESIM to have its operation swiftly limited to those territories from which they can operate.

More in general, while the NCMC generates a schedule of configurations in advance, using information about the current and predicted state of the system, it is also able to adjust the schedule in response to sudden changes in demand, terminal position, channel conditions and malfunctioning. As a result, system components, including ESIM, will enact configurations changes according to the schedule, in a “centralized intelligence/distributed execution” manner but also by reacting to unforeseen circumstances. Overall, the level of sophistication of current NCMC ensures a continuous, efficient, optimized and regulatory-compliant allocation of communications resources in real-time and under all conditions.

To conclude, given the capabilities described above, it is clear that the NCMC is able to execute “disable transmission” to ESIM when instructed to do so the case of interference or when a given country has not given the authorization to the ESIM to operate on the territory under its jurisdiction.

The above modus operandi is applicable also to GSO ESIM in Ka-band, which have already been operating under the control of an NCMC since a few years already and for which no significant interference events have been reported.

# 3 Summary

The information contained in section 1 of this attachment is provided to clarify the role and functionalities of the NCMC in one example implementation. This matter deals with the way ESIM networks could be operated and no specific implementation of NCMC should be mandated by the ITU, because a given system may implement the NCMC functionalities differently. Consequently, no regulatory provisions need to be included in the draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC-23)**.

WRC-23 may decide to take the above information into account when deliberating on the technical, regulatory and operational provisions to include in the draft new Resolution **[EUR-A116-NGSO-ESIM] (WRC-23)** and to which non-GSO ESIM shall be subject.

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

1. 1 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 pfd values indicated in Part 2 of Annex 1. [↑](#footnote-ref-1)
2. 2 These provisions do not apply to non-GSO systems using orbits with an apogee less than 2 000 km that employ frequency reuse schemes of at least three colours. [↑](#footnote-ref-2)