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| **World Radiocommunication Conference (WRC-19)Sharm el-Sheikh, Egypt, 28 October – 22 November 2019** |  |
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| PLENARY MEETING | **Addendum 5 toDocument 24-E** |
|  | **20 September 2019** |
|  | **Original: English** |
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| Asia-Pacific Telecommunity Common Proposals |
| Proposals for the work of the conference |
|  |
| Agenda item 1.5 |

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

Introduction

Earth stations in motion (ESIM) are earth stations that communicate with GSO FSS space stations but operate on moving platforms such as ships, aircraft and land vehicles. ESIM are intended to provide broadband connectivity.

WRC-15 introduced regulations for ESIM operating in the frequency bands 19.7-20.2 GHz and 29.5-30 GHz, contained in Resolution **156** (**WRC-15**). Resolution **158** (**WRC-15**) invites the ITU‑R to consider the use of the bands 17.7-19.7 GHz and 27.5-29.5 GHz by ESIM and take appropriate actions.

In the CPM Report to WRC-19 for agenda item 1.5 the following two methods have been identified;

**Method A** This method proposes no changes to the Radio Regulations (RR) and suppression of Resolution **158 (WRC-15)**.

**Method B** This method proposes to add a new footnote No. **5.A15** in RR Article **5** and a reference to a draft new WRC Resolution providing the conditions for the operation of ESIM and protection of the services to which the frequency bands are allocated, and consequential suppression of Resolution **158 (WRC-15)**.

APT common proposals for WRC-19 agenda item 1.5 are as shown below.

Proposals

ARTICLE 5

Frequency allocations

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

MOD ACP/24A5/1#49988

15.4-18.4 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 17.7-18.1FIXEDFIXED-SATELLITE(space-to-Earth) 5.484A ADD 5.A15(Earth-to-space) 5.516MOBILE | 17.7-17.8FIXEDFIXED-SATELLITE(space-to-Earth) 5.517 ADD 5.A15(Earth-to-space) 5.516BROADCASTING-SATELLITEMobile5.515 | 17.7-18.1FIXEDFIXED-SATELLITE(space-to-Earth) 5.484A ADD 5.A15(Earth-to-space) 5.516MOBILE |
|  | 17.8-18.1FIXEDFIXED-SATELLITE(space-to-Earth) 5.484A ADD 5.A15(Earth-to-space) 5.516MOBILE5.519 |  |
| 18.1-18.4 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B ADD 5.A15 (Earth-to-space) 5.520 MOBILE 5.519 5.521 |

**Reasons:** Add footnote applicable to the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz to reference the draft new Resolution as outlined in Method B of CPM Report.

MOD ACP/24A5/2#49989

18.4-22 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 18.4-18.6 FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B ADD 5.A15 MOBILE |
| 18.6-18.8EARTH EXPLORATION-SATELLITE (passive)FIXEDFIXED-SATELLITE(space-to-Earth) 5.522B ADD 5.A15MOBILE except aeronauticalmobileSpace research (passive) | 18.6-18.8EARTH EXPLORATION-SATELLITE (passive)FIXEDFIXED-SATELLITE(space-to-Earth) 5.516B 5.522B ADD 5.A15MOBILE except aeronautical mobileSPACE RESEARCH (passive) | 18.6-18.8EARTH EXPLORATION-SATELLITE (passive)FIXEDFIXED-SATELLITE(space-to-Earth) 5.522B ADD 5.A15MOBILE except aeronauticalmobileSpace research (passive) |
| 5.522A 5.522C | 5.522A | 5.522A |
| 18.8-19.3 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A ADD 5.A15 MOBILE |
| 19.3-19.7 FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B5.523C 5.523D 5.523E ADD 5.A15 MOBILE |

**Reasons:** Add footnote applicable to the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz to reference the draft new Resolution as outlined in Method B of CPM Report.

MOD ACP/24A5/3#49990

24.75-29.9 GHz

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

**Reasons:** Add footnote applicable to the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz to reference the draft new Resolution as outlined in Method B of the CPM Report.

ADD ACP/24A5/4#49991

5.A15The operation of earth stations in motion communicating with geostationary FSS space stations in the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz shall be subject to draft new Resolution **[ACP-A15] (WRC-19)**.(WRC‑19)

**Reasons:** Add footnote applicable to the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz to reference the draft new Resolution as outlined in Method B of the CPM Report.

ADD ACP/24A5/5#49993

draft new RESOLUTION [ACP-A15] (WRC-19)

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

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

considering

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

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

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

recognizing

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

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

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

*d)* that the successful compliance of this Resolution does not oblige any administration to authorize/licence any ESIM to operate within the territory under its jurisdiction unless such an operation it fully complies with its national jurisdiction;

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

resolves

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

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

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

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

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

1.1.3.1 (Examination of ESIM in relation to a GSO satellite network recorded in the MIFR)
upon receipt of the information provided in accordance with *resolves*1.1.3 above, the Bureau shall examine it in relation to the requirements referred to in *resolves*1.1.1 based on the information recorded in the MIFR and any other reliable information available to it . If following this examination, the Bureau concludes that the ESIM characteristics are within the envelope of the satellite network, the Bureau shall publish the results for information in the BR IFIC, otherwise the information shall be returned to the notifying administration;

1.1.3.2 (Examination of ESIM in relation to a GSO satellite at coordination stage which could subsequently be recorded in the MIFR) upon receipt of the information provided in accordance with *resolves*1.1.3 above, the Bureau shall examine it in relation to the requirements referred to in *resolves*1.1.1 based on the complete information submitted. If, following this examination, the Bureau concludes that the ESIM characteristics are within the envelope of the satellite network under coordination, the Bureau shall publish the results for information in the BR IFIC indicating the provisional nature of the coordination process with the remarks that once the coordination is successfully completed and recorded in the MIFR the finding would be reviewed and, if necessary, revised, otherwise the information shall be returned to the notifying administration;

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

Option 1

1.1.5 for the protection of non-GSO MSS feeder links operating in the frequency band 29.1‑29.5 GHz, ESIM communicating with GSO FSS networks shall comply with the provisions contained in Annex 1 to this Resolution;

**Reasons:** Studies are still on-going with the regard to the actual outcome of this particular item. Furthermore, although coexistence issues may be resolved through coordination, specific provisions would ensure protection in the absence of reaching an agreement through coordination efforts.

Option 2

1.1.5 is not needed;

**Reasons:** The band 29.1-29.5 GHz is allocated co-primarily to GSO FSS and to non-GSO MSS feeder links, and hence, coordination in this case is on a first-come-first-served basis. The concern arises when GSO FSS is the first comer and also operates ESIM. When non-GSO MSS feeder links comes latter, *resolves* 1.1.5 requires the operational ESIM to comply to conditions in Annex 1 of the draft new Resolution. It will not be feasible for an ESIM to protect non-GSO MSS feeder links once it has been operational. Also, *resolves* 1.1.5 inadvertently is establishing priority to non-GSO MSS over GSO FSS. The Radio Regulations in force, together with *resolves* 1.1.1 of the draft new Resolution [ACP-A15] (WRC-19) provide enough assurance that ESIM would not cause interference to space station receivers of non-GSO MSS feeder links.

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

1.1.7 ESIM shall not claim protection from BSS feeder link earth stations operating in the frequency band 17.7-18.4 GHz in accordance with the Radio Regulations and shall not affect their future development;

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

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

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

1.2.3 for the implementation of resolves 1.2.2 above, the notifying administration of the GSO FSS network with which aeronautical ESIM communicate shall send the Bureau the relevant Appendix **4** information related to the characteristics of the aeronautical ESIM. The Bureau shall examine the information with respect to its conformity with the pfd limits specified in Part 2 of Annex 2 on the Earth’s surface. Should the result of examination is unfavourable the BR shall return submission to the notifying administration of ESIM;

NOTE - Revision of Appendix **4** of the Radio Regulations is required accordingly for submission of aeronautical ESIM characteristics including maximum input power density to antenna, antenna radiation pattern, antenna mounted type (fuselage or tail), fuselage attenuation characteristics (Report ITU-R M.2221 or other attenuation characteristics), operating minimum altitude (if 0 m, no altitude limitation) and any other technical characteristics which are required to calculate pfd value at the Earth’s surface as well as techniques to comply with the required pfd value.

1.2.4 the transmitting land ESIM in the 27.5-29.5 GHz frequency band shall not cause unacceptable interference to terrestrial services in the above-mentioned frequency band operating in accordance with the Radio Regulations and shall not affect the future development of these services;

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

NOTE - May not be needed due to the fact that is covered somewhere else in other parts of this Resolution provided that the above mentioned commitment covers both space and terrestrial services;

**With respect to protection to terrestrial service by any type of ESIM using Annex 2 with its pfd approach including various options providing modality how to implement these options as contained in CPM-19 Report, no consensus was reached at APG19-5 meeting.**

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

2.1 that the operation of ESIM shall be strictly limited to provide civil application only thus any such operation for non-civil application purposes is prohibited;

3 that the notifying administration for the satellite network within which ESIM communicate with in collaboration with the administration authorizing operation of ESIM in its territory shall ensure that the ESIM have the capability to limit the operation to the territory or territories of administrations having authorized those earth stations and to comply with Article **18**;

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

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

4.2 all necessary measures are to be taken so that ESIM are subject to permanent monitoring and control by a Network Control and Monitoring Centre (NCMC) or equivalent facility and are capable of receiving and acting upon at least “enable transmission” and “disable transmission” commands from the NCMC or equivalent facility Such network control capability/facilities relating to operation of ESIM need to be made available to the administrations authorizing ESIM in their territories;

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

4.4 a point of contact shall be provided for the purpose of tracing any suspected cases of unacceptable interference from ESIM;

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

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

5.2 the administration of the country in which the ESIM is authorized and the notifying administration of the satellite network with which the ESIM communicate shall, upon receipt of a report of unacceptable interference, identify the suspected ESIM with the information of this identification/the location of the ESIM and take required action jointly or individually, as the case may be, to eliminate or reduce interference to an acceptable level;

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

instructs the Director of the Radiocommunication Bureau

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

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

3 to report to future WRCs any difficulties or inconsistencies encountered in the implementation of this Resolution,

invites administrations

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

NOTE - Once Annex 3 is developed, an *“invites administrations”* is to be included in this Resolution to be used in implementation of this Annex or authorizing an ESIM, as well as for bilateral or multilateral negotiations.

instructs the Secretary-General

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

Annex 1 to draft new Resolution [ACP-A15]

Provisions for ESIM to protect non-GSO FSS systems in the frequency band 27.5‑29.5 GHz

1 In order to protect those non-GSO FSS systems referred to in *resolves*1.1.4 of this Resolution, ESIM shall comply with the following provisions:

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

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

Option 1

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

Option 2

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

**With respect to emission bandwidth larger than 100 MHz and the maximum ESIM on-axis e.i.r.p. no consensus was reached on any of two options contained in the CPM-19 Report.**

Option 1

2 In order to protect those non-GSO MSS feeder-links referred to in *resolves*1.1.5 Option 1 of this Resolution, ESIM shall comply with the following:

OTE - Appropriate measures to be developed based on the outcome of ongoing studies to protect non-GSO MSS feeder-links referred to in *resolves* 1.1.5 Option 1 of this Resolution.

Option 2

Consistent with *resolves*1.1.5 Option 2, item 2 is not required.

Annex 2 to draft new Resolution [ACP-A15]

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

Part 1: MARITIME ESIM

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

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

1.2 the maximum maritime ESIM e.i.r.p. spectral density towards the horizon shall not exceed 12.98 dB(W/1 MHz). Transmissions from maritime ESIM with higher e.i.r.p. spectral density levels towards the territory of any coastal state shall be subject to the prior agreement of the concerned coastal State together with the mechanism by which this level is to be maintained.

**NOTE - Modality to implement this paragraph and entity to make this examination need to be specified.**

Part 2: AERONAUTICAL ESIM

With respect to the protection of terrestrial services by A-ESIM two approaches were proposed

**Approach 1:**

Establish of pfd mask/limit which shall not be exceeded on any point at the earth surface.

**Approach 2:**

Establish of altitude limit below which aircraft on which ESIM operates shall not transmit.

No consensus was reached on either of these two approaches or both approaches together thus no ACP is proposed in this regard.

Annex 3 to draft new Resolution [ACP-A15]

Land ESIM and overall responsibilities for
the operation of all three ESIM types

or

Guidelines to assist administrations to authorize ESIM
in the frequency band 27.5-29.5 GHz

No consensus was reached on this matter therefore no ACP is proposed in this regard.

**Reasons:** Draft new Resolution as extracted from Method B of CPM Report with variations included based on agreement from APT Members.

SUP ACP/24A5/6#49987

RESOLUTION 158 (WRC‑15)

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

**Reasons:** No longer necessary after WRC-19.

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