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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 2 to Document 50(Add.6)-E** |
|  | **4 October 2019** |
|  | **Original: English** |
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| Singapore (Republic of) | |
| Proposals for the work of the conference | |
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| Agenda item 1.6 | |

1.6 to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution **159 (WRC-15)**;

Introduction

There are currently no regulatory provisions for sharing between non-GSO systems and GSO networks in the 50/40 GHz frequency bands. In addition, there are no mechanisms in the Radio Regulations (RR) establishing coordination procedures applicable to non-GSO systems operating within the FSS and BSS allocations in frequency bands in the 37.5 to 51.4 GHz frequency range.

ITU-R studies in the 50/40 GHz frequency bands have been conducted on sharing between non-GSO systems and GSO FSS and BSS networks. These studies concluded that developing epfd limits based on the operational parameters for a single, specific, non-GSO system results in spectrum inefficiencies for other non-GSO systems.

On the other hand, these studies identify an alternative methodology that provides more flexibility on the design and operation of non-GSO systems operating in the 50/40 GHz frequency bands and concludes that the protection of GSO networks is possible based on an assessment of aggregate interference from multiple non-GSO systems, with different configurations and orbits.

Other ITU-R studies were unable to conclude on the appropriate epfd limits to protect GSO FSS and BSS networks from the operation of non-GSO FSS systems, due to the number of possible configurations and the complexity of the non-GSO FSS systems that can be considered.

While there may not be an agreement on epfd limits, there is general consensus that it is possible to achieve compatibility in the 50/40 GHz frequency bands that would allow non-GSO FSS systems to operate while ensuring protection to GSO satellite networks in the FSS, MSS, and BSS, based on a decrease in availability and throughput.

WRC-19 agenda item 1.6 also considered the protection of the Earth exploration-satellite service (EESS) (passive) and radio astronomy services in adjacent bands. ITU-R studies of compatibility between non-GSO FSS systems and EESS (passive) have shown that the limits currently in Resolution **750 (Rev.WRC-15)** are not sufficient for the protection of EESS (passive). New limits to Resolution **750 (Rev.WRC-15)** have also been proposed to address compatibility issues between GSO FSS networks and EESS (passive).

Therefore there are two key issues within the WRC-19 agenda item 1.6:

• Issue 1: Developing a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2‑50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space)

• Issue 2: Revising Resolution **750 (Rev.WRC-15)** for the protection of EESS (passive) in the band 50.2-50.4 GHz

Concerning Issue 2, taking into account the outcome from other regional organisations including CEPT, Singapore supports the following solutions:

# Issue 2

Singapore supports revision of limits for non-GSO systems only as we are of the view that the limits for GSO networks in Resolution **750 (Rev.WRC-15)** should not be modified. However, in order to achieve a resolution on this Issue, as a compromise, Singapore could agree to the alternative method outlined below which includes the following modifications to the Radio Regulations:

– Modification of Resolution **750 (Rev.WRC-15)** to include unwanted emission power limits in order to protect EESS (passive) systems from non-GSO FSS systems operating in the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz;

– Development of a new WRC Resolution:

a) to define provisional limits for earth stations operating with GSO FSS networks brought into use on and after 01/01/2024 and not to allow use of antenna gain less than 54 dBi by earth stations of GSO FSS networks until WRC-23;

b) to further review the non-GSO limitsand the provisional GSO limits as well as to assess the possibility of mitigation techniques for earth stations of GSO FSS networks and non-GSO FSS systems at WRC-23 taking into account the EESS sensor characteristics in Recommendation ITU-R RS.1861-0 and protection criteria in Recommendation ITU-R RS.2017-0.

Proposals

MOD SNG/50A6A2/1#50013

RESOLUTION 750 (Rev.WRC‑19)

Compatibility between the Earth exploration-satellite service (passive) and relevant active services

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

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TABLE 1-1

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| EESS (passive) band | Active service band | Active service | Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band1 |
| 1 400- 1 427 MHz | 1 427- 1 452 MHz | Mobile | −72 dBW in the 27 MHz of the EESS (passive) band for IMT base stations  −62 dBW in the 27 MHz of the EESS (passive) band for IMT mobile stations2, 3 |
| … | … | … | … |
| 36-37 GHz | 37.5-38 GHz | Non-GSO FSS  (s‑to‑E) | For space stations operating with non-GSO systems having more than 1000 satellites at an altitude below 700 km brought into use after the date of entry into force of the Final Acts of WRC‑19:  e.i.r.p. of -34 dBW into the 100 MHz of the EESS (passive) band above -18.6° elevation |
| 50.2-50.4 GHz | 49.7-50.2 GHz | Fixed-satellite (E‑to‑s)4 | For stations operating with GSO networks brought into use after the date of entry into force of the Final Acts of WRC‑07 and before 1 January 2024 (see also Resolution **[SNG-A16-EESS.COMP] (WRC-19)**):  −10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi  −20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi  For stations operating with non-GSO systems brought into use before the date of entry into force of the Final Acts of WRC‑19:  −10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi  −20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi  For stations operating with non-GSO systems brought into use after the date of entry into force of the Final Acts of WRC‑19 (see also Resolution **[SNG-A16-EESS.COMP] (WRC-19)**):  −48.7 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi  −51.3 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi  ***Editor’s note:*** *these proposed limits may be amended at WRC-19 subject to further consideration* |
| 50.2-50.4 GHz | 50.4-50.9 GHz | Fixed-satellite (E‑to‑s)4 | For stations operating with GSO networks brought into use after the date of entry into force of the Final Acts of WRC‑07 and before 1st of January 2024 (see also Resolution **[SNG-A16-EESS.COMP] (WRC-19)**):  −10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi  −20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi  For stations operating with non-GSO systems brought into use before the date of entry into force of the Final Acts of WRC‑19:  −10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi  −20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi  For stations operating with non-GSO systems brought into use after the date of entry into force of the Final Acts of WRC‑19 (see also Resolution **[SNG-A16-EESS.COMP] (WRC-19)**):  −48.7 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi  −51.3 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi  ***Editor’s note:*** *these proposed limits may be amended by at WRC-19 subject to further consideration* |
| 52.6-54.25 GHz | 51.4-52.6 GHz | Fixed | For stations brought into use after the date of entry into force of the Final Acts of WRC‑07:  −33 dBW in any 100 MHz of the EESS (passive) band |
| 1 The unwanted emission power level is to be understood here as the level measured at the antenna port unless otherwise specified.  2 This limit does not apply to mobile stations in the IMT systems for which the notification information has been received by the Radiocommunication Bureau by 28 November 2015. For those systems, −60 dBW/27 MHz applies as the recommended value.  3 The unwanted emission power level is to be understood here as the level measured with the mobile station transmitting at an average output power of 15 dBm.  4 The limits apply under clear-sky conditions. During fading conditions, the limits may be exceeded by earth stations when using uplink power control. | | | |

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**Reasons:** To add unwanted emission power limits in the Earth-to-space direction in order to protect EESS (passive) in the frequency band 50.2 50.4 GHz from non-GSO FSS systems operating in the adjacent frequency bands 49.7-50.2 GHz and 51.4-52.6 GHz and to refer to the Resolution **[SNG-A16-EESS.COMP] (WRC-19)**.

ADD SNG/50A6A2/2

Draft New Resolution [SNG-A16-EESS.COMP] (WRC-19)

Compatibility between the fixed-satellite service and the Earth exploration-satellite service (passive) in the 50.2-50.4 GHz

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

considering

*a)* that WRC-19 has decided to establish in this Resolution some provisional unwanted emission limits applicable after 1 January 2024 for earth stations operating with GSO networks to protect the Earth exploration-satellite service (EESS) in the 50.2-50.4 GHz;

*b)* that WRC-19 has included in Resolution **750** **(Rev. 2019)** some unwanted emission limits for earth stations operating with non-GSO systems to protect EESS in the 50.2-50.4 GHz;

*c)* that the unwanted emission limits resulting from ITU-R studies carried out in preparation of WRC-19 were focusing on high interference configuration, where the EESS satellite is pointing towards the fixed-satellite service (FSS) earth stations or where the FSS earth stations is pointing towards the EESS satellite;

*d)* that mitigation techniques have been envisaged based on the dynamic of the interference, where the unwanted emission limits could be relaxed except during period with high interference configuration;

*e)* that such relaxed limits would require adequate regulations to provide confidence for effective protection of EESS,

noting

that some studies carried out in preparation for WRC-19 have shown that the protection of EESS in the band 50.2-50.4 GHz would require to tighten the provisional unwanted emission limits set out in this Resolution by about 7 dB for gateway earth stations and by about 33 dB for user terminal earth stations,

recognizing

that sensor’s characteristics (as in Recommendation ITU-R RS.1861-0) and protection criteria (as in Recommendation ITU-R RS.2017-0 ) used in studies conducted prior to WRC-19 are not expected to evolve until WRC-23,

resolves

1 that unwanted emissions of earth stations operating with GSO networks in the frequency band 49.7-50.2 GHz and 50.4-50.9 GHz brought into use after 1 January 2024 shall not exceed:

−25 dBW into the 200 MHz of the EESS (passive) band 50.2-50.4 GHz for earth stations having an elevation angle below 80°

−45 dBW into the 200 MHz of the EESS (passive) band 50.2-50.4 GHz for earth stations having an elevation angle equal or above 80°;

2 that until unwanted emissions of earth stations having an antenna gain less than 54 dBi are specifically defined at WRC-23, deployment of such stations should be avoided,

resolves to invite ITU-R

1 to study further the protection of EESS (passive) in the band 50.2-50.4 GHz from the fixed-satellite service operating in adjacent bands for both GSO and non-GSO systems, including the feasibility of mitigation techniques based on the dynamic of the interference;

2 taking into account the results of the above studies, to provide recommendations to the Conference, enabling that Conference:

– to review the limits in Resolution **750 (Rev.WRC-19)** applicable to non-GSO systems for the protection of EESS (passive) in the band 50.2-50.4 GHz

– to review the provisional limits listed in *resolves* 1 applicable to GSO networks and to modify Resolution **750 (Rev.WRC-19)** accordingly

– to develop regulatory provisions for the implementation of mitigation techniques, if studies under *resolves to invite ITU-R* 1 indicate their feasibility,

invites the 2023 World Radiocommunication Conference

to consider the results of the studies above and take appropriate actions.

**Reasons:** To define provisional limits for earth stations operating with GSO networks and to specify studies to be carried out in order for WRC-23 to review limits for both GSO and non-GSO earth stations at WRC-23.

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