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| **World Radiocommunication Conference (WRC-19)Sharm el-Sheikh, Egypt, 28 October – 22 November 2019** |  |
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|  | CPG(19)143 ANNEX VIII-06 |
| PLENARY MEETING | **Addendum 6 toDocument 16-E** |
|  | **30 August 2019** |
|  | **Original: English** |
|  |
| European Common Proposals |
| Proposals for the work of the conference |
|  |
| 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

Studies in CEPT reviewed technical, operational issues and regulatory provisions for non-geostationary (GSO) fixed-satellite service (FSS) systems in the 50/40 GHz frequency range.

CEPT studies have shown that in the 50/40 GHz frequency bands propagation impairments can substantially affect FSS satellite links. To account for the differences in propagation from lower frequency bands, a new ITU-R Resolution on sharing criteria for FSS systems in the 50/40 GHz frequency bands is being developed in parallel with the studies associated with this agenda item.

Multiple sharing studies have been conducted on sharing between non-GSO and GSO FSS networks. The results of these studies showed that it is possible to achieve compatibility in the 50/40 GHz band by FSS systems that would allow non-GSO systems to operate while ensuring protection to GSO satellite networks in the FSS, mobile-satellite service (MSS), and broadcasting-satellite service (BSS).

CEPT studies on compatibility between non-GSO FSS systems and Earth exploration-satellite service (EESS) (passive) have shown that the limits currently in Resolution **750 (WRC-15)** are not sufficient for the protection of EESS (passive) in the adjacent frequency band 50.2‑50.4 GHz. These studies show that an unwanted emission limit of -51.3 dBW/200 MHz for non-GSO FSS user equipment, -48.7 dBW/200 MHz for non-GSO gateways would be required to meet the EESS (passive) protection criteria in Recommendation ITU-R RS.2017, taking into account an apportionment of 3 dB.

CEPT studies of compatibility between GSO FSS systems and EESS (passive) have shown that the limits currently in Resolution **750 (WRC-15)** are not sufficient for the protection of EESS (passive) in the adjacent frequency band 50.2-50.4 GHz. These studies show that an unwanted emission limit of -58.1 dBW/200 MHz for GSO FSS user equipment and -37 dBW/200 MHz for GSO gateways with elevation angles lower than 80° and -52 dBW/200 MHz for GSO gateways with elevation angles higher or equal to 80° would be required to meet the EESS (passive) protection criteria in Recommendation ITU-R RS.2017, taking into account an apportionment of 3 dB.

This studies have also shown that the out-of-band emission mask contained in Recommendation ITU-R SM.1541 would not be sufficient to ensure the protection of EESS (passive) in the band 36‑37 GHz when considering constellations of more than 1 000 satellites which altitude is below the EESS (passive) satellite altitude. The unwanted emission e.i.r.p. limit radiated by non-GSO FSS satellites towards space (i.e. above -18.6° elevation for satellites at 350 km altitude) would be ‑34 dBW/100 MHz considering no apportionment.

Based on the sharing studies results, CEPT proposes a method to satisfy this agenda item which includes the following modifications to the Radio Regulations:

- Include a new footnote No. **5.A16** in order to address the coordination between non-GSO FSS systems under RR No. **9.12** of the subject frequency bands;

- Add a new footnote in the frequency band 39.5-40.5 GHz in all Regions to address the coordination between MSS and non-GSO FSS systems under RR No. **9.12**;

- Use the Recommendation ITU-R S.1503 to calculate the levels of interference from non-GSO satellite systems;

- Modify Article **22** to include single-entry limits in terms of degradation of availability and throughput in order to protect GSO FSS satellite networks in the 50/40 GHz frequency bands from non-GSO FSS systems operating in the subject frequency ranges;

- Modify Article **22** to include aggregate limits in terms of availability and throughput in order to protect GSO FSS satellite networks from multiple non-GSO FSS systems operating in the subject frequency ranges and develop a new WRC Resolution providing the procedure to ensure that aggregate limits will not be exceeded;

- Develop a new Resolution containing generic GSO reference links, calculation procedures and supplemental GSO reference links, which will be used to verify the compliance of non-GSO systems with single-entry and aggregate limits;

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

- Develop a new Resolution 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-NGSO earth station at WRC-23.

Proposals

ARTICLE 5

Frequency allocations

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

MOD EUR/16A6/1

34.2-40 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 37.5-38 FIXED FIXED-SATELLITE (space-to-Earth) ADD 5.A16 MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547 |
| 38-39.5 FIXED FIXED-SATELLITE (space-to-Earth) ADD 5.A16 MOBILE Earth exploration-satellite (space-to-Earth) 5.547 |
| 39.5-40 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5.A16 MOBILE MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547 ADD 5.B16 |

**Reasons:** Add a new footnote **5.A16** to address the coordination between non-GSO FSS systems under No. **9.12.** Add a new footnote **5.B16** in the frequency band 39.5-40.5 GHz in all Regions to address the coordination between MSS and non-GSO FSS systems under No. **9.11A**.

MOD EUR/16A6/2

40-47.5 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 40-40.5 EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5.A16 MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth) ADD 5.B16 |
| 40.5-41FIXEDFIXED-SATELLITE (space-to-Earth) ADD 5.A16BROADCASTINGBROADCASTING-SATELLITEMobile5.547 | 40.5-41FIXEDFIXED-SATELLITE (space-to-Earth) 5.516B ADD 5.A16BROADCASTINGBROADCASTING-SATELLITEMobileMobile-satellite (space-to-Earth)5.547 | 40.5-41FIXEDFIXED-SATELLITE (space-to-Earth) ADD 5.A16BROADCASTINGBROADCASTING-SATELLITEMobile5.547 |
| 41-42.5 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5.A16 BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I |
| 42.5-43.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149 5.547 |
| 43.5-47 MOBILE 5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554 |
| 47-47.2 AMATEUR AMATEUR-SATELLITE |
| 47.2-47.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.A16 MOBILE 5.552A |

**Reasons:** Add a new footnote **5.A16** to address the coordination between non-GSO FSS systems under No. **9.12.** Add a new footnote **5.B16** in the frequency band 39.5-40.5 GHz in all Regions to address the coordination between MSS and non-GSO FSS systems under No. **9.11A**.

MOD EUR/16A6/3

47.5-51.4 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 47.5-47.9FIXEDFIXED-SATELLITE(Earth-to-space) 5.552 ADD 5.A16(space-to-Earth) 5.516B 5.554AMOBILE | 47.5-47.9 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.A16 MOBILE |
| 47.9-48.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A |
| 48.2-48.54FIXEDFIXED-SATELLITE(Earth-to-space) 5.552 ADD 5.A16(space-to-Earth) 5.516B5.554A 5.555BMOBILE | 48.2-50.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.338A 5.552 ADD 5.A16 MOBILE |
| 48.54-49.44FIXEDFIXED-SATELLITE(Earth-to-space) 5.552 ADD 5.A16MOBILE5.149 5.340 5.555 |  |
| 49.44-50.2FIXEDFIXED-SATELLITE(Earth-to-space) 5.338A 5.552 ADD 5.A16(space-to-Earth) 5.516B5.554A 5.555BMOBILE |  5.149 5.340 5.555 |
| 50.2-50.4 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 |
| 50.4-51.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.338A ADD 5.A16 MOBILE Mobile-satellite (Earth-to-space) |

**Reasons:** Add a new footnote **5.A16** to address the coordination between non-GSO FSS systems under No. **9.12.**

ADD EUR/16A6/4

5.A16 The use of 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) by a non‑geostationary‑satellite system in the fixed-satellite service is subject to the application of the provisions of No. **9.12** for coordination with other non-geostationary satellite systems in the fixed-satellite service, but not with non-geostationary satellite systems in other services.     (WRC-19)

**Reasons:** Add RR footnote No. **5.A16** to include the subject frequency bands in order to address the coordination between non-GSO FSS systems under No. **9.12**.

ADD EUR/16A6/5

5.B16 The use of the frequency bands 39.5-40 and 40-40.5 GHz by the non-geostationary satellite-systems in the mobile-satellite service (space-to-Earth) and non‑geostationary-satellite systems in the fixed-satellite service (space-to-Earth) is subject to coordination under No. **9.12**, but not with non-geostationary satellite systems in other services.     (WRC-19)

**Reasons:** Resolution **159 (WRC-15)** resolves to conduct studies of regulatory provisions for the operation of non-GSO FSS satellite systems, while ensuring protection of GSO satellite networks in the FSS, MSS and BSS. The protection of GSO satellite networks in the FSS and BSS is provided by applying the limitations of Article **22** of the RR. In order to cover MSS case it is proposed to address the coordination between MSS and non-GSO FSS systems under No. **9.12**.

ARTICLE 22

Space services1

Section II − Control of interference to geostationary-satellite systems

**Editor´s Note:** The values [2.5]% for the single entry and [5]% for the aggregate interference are provisional and are meant to be further reviewed and confirmed at WRC-19.

ADD EUR/16A6/6

22.5L 9) A non-geostationary-satellite system in the fixed-satellite service in the frequency bands 37.5-39.5, 39.5-42.5, 47.2-50.2, and 50.4-51.4 GHz shall not exceed:

* a single-entry increase of 3% of time allowance for the C/N value associated with the shortest percentage of time specified in the short-term performance objective of the generic GSO reference links where this C/N value represents the minimum threshold needed to maintain the link; and
* a single-entry permissible allowance of at most [2.5]% reduction in time-weighted average spectral efficiency calculated on an annual basis of the generic GSO reference links long term performance relative to the long term maximum achievable throughput in the presence of propagation degradation losses calculated on an annual basis.

The calculation procedures given Resolution **[EUR-A16-SINGLE.ENTRY] (WRC-19)** shall apply.      (WRC-19)

**Reasons:** Updates to the provision to calculate the maximum permissible interference from a non-GSO satellite system based on the probability density function issued from Recommendation ITU-R S.1503.

ADD EUR/16A6/7

22.5M 10) Administrations operating or planning to operate non-geostationary-satellite systems in the fixed-satellite service 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) shall ensure that the aggregate interference to GSO FSS and BSS networks caused by all non-GSO FSS systems operating in these frequency bands does not exceed:

* an increase of 10% of time allowance for the C/N value associated with the shortest percentage of time specified in the short-term performance objective of the generic GSO reference links where this C/N value represents the minimum threshold needed to maintain the link; and
* a permissible allowance of at most [5%] reduction in time-weighted average spectral efficiency calculated on an annual basis of the generic GSO reference links long term performance relative to the long term maximum achievable throughput in the presence of propagation degradation losses calculated on an annual basis

for each generic link included in Annex 1 of Resolution **[EUR-A16-SINGLE.ENTRY] (WRC-19)**.

And

* an increase of 10% of time allowance for the C/N values associated with the short-term performance objectives of the supplemental GSO reference links; and
* a permissible allowance of at most [5%] reduction in time-weighted average spectral efficiency calculated on an annual basis of the supplemental GSO reference links long term performance relative to the long term maximum achievable throughput in the presence of propagation calculated on an annual basis

where the supplemental GSO reference links are contained in Annex 3 of Resolution **[EUR-A16-SINGLE.ENTRY] (WRC-19)**. Resolution **[EUR-A16-AGG.SHARING] (WRC-19)** shall also apply     (WRC-19)

**Reasons:** Modify RR Article **22** to include aggregate unavailability and decreased capacity limits for multiple non-GSO FSS systems to protect GSO networks in these bands.

ADD EUR/16A6/8

22.5N An administration operating a non-geostationary-satellite system in the fixed-satellite service which is in compliance with the limits in Nos. 22.5L shall be considered as having fulfilled its obligations under No. 22.2 with respect to any geostationary-satellite network, provided that the resulting interference from the non-geostationary-satellite system in the fixed-satellite service into any supplemental GSO reference link does not exceed

* a single-entry increase of 3% of time allowance for the C/N values associated with the short-term performance objectives of the supplemental GSO reference links; and
* a single-entry permissible allowance of at most [2.5]% reduction in time-weighted average spectral efficiency calculated on an annual basis of the supplemental GSO reference links long term performance relative to the long term maximum achievable throughput in the presence of propagation degradation losses calculated on an annual basis

where the supplemental GSO reference links are contained in Resolution **[EUR-A16-SINGLE.ENTRY] (WRC-19)**.    (WRC-19)

**Reasons:** To establish operational limits that must be met by operational non-GSO systems based on supplemental GSO link budgets provided by administrations and reflecting GSO links that supplement the generic links already considered under No. **22.5L**.

ARTICLE 9

Procedure for effecting coordination with or obtaining agreement of other administrations1, 2, 3, 4, 5, 6, 7, 8, 9    (WRC‑15)

Section II − Procedure for effecting coordination12, 13

Sub-Section IIA − Requirement and request for coordination

MOD EUR/16A6/9

9.35 *a)* examine that information with respect to its conformity with No. 11.31 MOD19; (WRC‑19)

MOD EUR/16A6/10

19 9.35.1The Bureau shall include the detailed results of its examination under No. 11.31 of compliance with the limits in Tables **22-1** to **22-3** of Article **22** or the applicable single-entry limits in No. **22.5L** in the publication under No. **9.38**.     (WRC‑19)

**Reasons:** Resolution **159 (WRC-15)** resolves to conduct studies of regulatory provisions for the operation of non-GSO FSS satellite systems, while ensuring protection of GSO satellite networks in the FSS, MSS and BSS. In order to cover FSS and BSS cases it is proposed to address this issue by Bureau examination of non-GSO filings on the criteria presented in in **22.5L**.

MOD EUR/16A6/11

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),

…

TABLE 1-1

|  |  |  |  |
| --- | --- | --- | --- |
| EESS (passive) band | Activeservice band | Active service | Limits of unwanted emission power fromactive service stations in a specified bandwidthwithin 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 | NGSO 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 1st of January 2024 (see also Resolution **[EUR-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 dBiFor 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 dBiFor 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 **[EUR-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 CEPT at WRC-19 subject to further consideration within CEPT* |
| 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 **[EUR-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 dBiFor 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 dBiFor 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 **[EUR-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 CEPT at WRC-19 subject to further consideration within CEPT* |
| 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. |

…

**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 **[EUR-A16-EESS.COMP] (WRC-19)**.

ADD EUR/16A6/12

Draft New Resolution [EUR-A16-SINGLE.ENTRY] (WRC-19)

Application of Article 22 of the Radio Regulations to the Protection of Geostationary Fixed-Satellite Service and Broadcasting-Satellite Service Networks from Non-Geostationary Fixed-Satellite Service Systems in the Frequency Bands 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz, and
50.4-51.4 GHz

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

considering

*a)* that geostationary (GSO) and non-geostationary (non-GSO) fixed-satellite service (FSS) networks may operate in the frequency bands 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4‑51.4 GHz;

*b)* that this conference adopted, in Article **22**, single-entry and aggregate operating provisions applicable to the operations of non-GSO FSS systems in the frequency bands 37.5‑39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHzto protect GSO networks operating in the same frequency bands;

*c)* that ITU‑R has developed Recommendation ITU‑R S.1503 to provide a methodology on how to compute the equivalent power flux density (epfd) concept for calculation of interference from a non-GSO system into potentially affected GSO earth stations and satellites;

*d)* that the calculation methodology contained in Recommendation ITU-R S.1503 results in the epfd generated by a non-GSO FSS system considered and a GSO location that corresponds to the worst case geometry that generates the highest levels of epfd down corresponding to the considered receive GSO earth station antenna size,

recognizing

that, in accordance with calculations utilizing Recommendation ITU-R S.1503, the verification of the global epfd interference of a non-GSO system can be carried out by a set of representative link budgets having characteristics that encompass worldwide GSO network deployments that are independent of any specific geographic locations,

resolves

1 that during the examination under Nos. **9.35** and **11.31**, as applicable, of a non-GSO FSS satellite system with frequency assignments in the 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2‑50.2 GHz, and 50.4-51.4 GHz frequency bands, the representative technical characteristics of generic GSO satellite networks contained in Annex 1 shall be used in conjunction with the methodology in Annex 2 to establish compliance with No. **22.5L**;

2 that notified frequency assignments to non-GSO FSS systems shall receive either a favourable finding or an unfavourable finding following the examination under No. **9.35** or **11.31**, as applicable, with respect to the single-entry operating provisions given in **22.5L**;

3 that when ensuring conforming with the single-entry limits contained in No. **22.5N**, the notifying administrations responsible for the relevant non-GSO systems shall use the supplemental links contained in Annex 3 at the time of the notification of the non-GSO system and take into account relevant ITU-R Recommendations,

invites administrations

to submit additional supplemental GSO reference links to the ITU-R for the interference evaluations specified in Nos. **22.5M** and **22.5N**,

invites the ITU Radiocommunication Sector

1 to study and develop a methodology for validating the supplemental GSO reference links submitted under invites administrations above;

2 to collect and analyse the additional supplemental GSO reference links submitted by administrations,

instructs the Director of the Radiocommunication Bureau

1 to encourage administrations to support the development of validation software for the supplemental GSO reference links submitted under *invites administrations* above;

2 to report to WRC the additional supplemental links submitted to the ITU-R for consideration of the review of Annex 3 to this Resolution.

ANNEX 1 TO RESOLUTION [EUR-A16-SINGLE.ENTRY] (WRC-19)

Generic GSO satellite system characteristics for evaluation of compliance with single-entry requirements for non-GSO systems

The data in Annex 1 are to be regarded as a generic range of representative technical characteristics of GSO networks deployments that are independent of any specific geographic location, to be used only for establishing the interference impact of a non-GSO system into GSO satellite networks and not as a basis for coordination between satellite networks.

**Editor´s Note:** The values contained in Table 1 and 2 below are provisional and are meant to be further reviewed and confirmed at WRC-19.

Table 1: Generic link parameters of GSO links to be used in examination of the downlink (space-Earth) impact from a non-GSO network

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Generic Link Parameters = service |  |  |  |  |  |
|  | Link type | User #1 | User #2 | User #3 | Gateway |  |
| 1.1 | Frequency band (GHz) | 40 | 40 | 40 | 40 |  |
| 1.2 | e.i.r.p. density (dBW/MHz) | 44 | 44 | 44 | 44 |  |
| 1.3 | Dish size (m) | 0.45 | 0.6 | 2 | 9 |  |
| 1.3 | Bandwidth (MHz) | 1 | 1 | 1 | 1 |  |
| 1.4 | ES antenna gain pattern | S.1428 | S.1428 | S.1428 | S.1428 |  |
| 1.5 | ES antenna efficiency | 0.65 | 0.65 | 0.6 | 0.55 |  |
| 1.6 | Additional link losses (dB) | 1 | 1 | 1 | 1 |  |
| 1.7 | Additional link margin (dB) | 3 | 3 | 3 | 3 |  |
|  |  |
| **2** | **Generic Link Parameters -Parametric Analysis** | **Parametric Cases for Evaluation** |  |
| 2.1 | e.i.r.p. density variation | ± 3 dB from value in 1.2 |  |
| 2.2 | Elevation angle (deg) | 20, 55, 90 |  |
| 2.3 | 0.01% Rain Rate (mm/hr) | 10, [25], 50, 100 |  |
| 2.4 | Height of ES (m) | 0, 500, 1000 |  |
| 2.5 | ES noise temperature (K) | [250, 300] |  |
| 2.6 | Threshold C/N (dB) | [-2.5, 7, 12] |  |
|  |  |
| **3** | **Example Implementation – Link Calculation** | **First Case parametric taken for examples** | **Equations to Calculate Downlink Availability** |
| 3,1 | ES Peak gain (dBi) | 34.7 | 46.1 | 56.2 | 68.9 | $$G\_{max}=10log\_{10}\left(η\left(\frac{πDf}{c}\right)^{2}\right)$$ |
|  | *Interim step: calculate the latitude corresponding with the elevation, ε* |  |  |  |  | $$ϕ=sin^{-1}\left(\frac{R\_{e}}{R\_{geo}}\sin(\left(\frac{π}{2}+ϵ\right))\right)$$ |
|  |  |  |  |  |  | $$Latitude=90-\left(ϕ+ϵ\right)$$ |
| 3.2 | Path length (km) | 39554.4 | 39554.4 | 39554.4 | 39554.4 | $$D^{2}=R\_{e}^{2}+R\_{geo}^{2}-2R\_{e}R\_{geo}cos\left(latitude\right)$$ |
| 3.3 | Path loss (dB) | 216.4 | 216.4 | 216.4 | 216.4 | $$L\_{fs}=32.45+20log\_{10}\left(f\_{MHz}\right)+20log\_{10}\left(d\_{km}\right)$$ |
| 3.4 | Unfaded wanted single strength (dBW/MHz) | -138.8 | -127,3 | -117.2 | -104.5 | $$C\_{u}=EIRP-L\_{fs}+G\_{RX}-L\_{o}$$ |
| 3.5 | Noise plus margin (dBW/MHz) | -141.6 | -141.6 | -141.6 | -141.6 | $$N+M=10log\_{10}\left(T\right)+60-k+M\_{0}$$ |
|  |
| **4** | **Validation Checks** |  |
| 4.1 | Margin for rain fade (dB) | 2.8 | 14.3 | 24.4 | 37.1 | $$A\_{rain}=C\_{u}-\left(N+M\right)-T(\frac{C}{N})$$ |
| 4.2 | *PFDval* (dB(W/(m2 · MHz))) | -118.9 | -118.9 | -118.9 | -118.9 | $$pfd=EIRP-10log\_{10}\left(4πD\_{m}^{2}\right)$$ |
| 4.3 | Delta from Article 21 | -11.4 | -11.4 | -11.4 | -11.4 |  |

The following checks are done to ensure the combination of Generic and Parametric Parameters are valid:

1. The dish size, D, should be in the range 0.45 ≤ D ≤ 9m
2. The rain margin should be greater than zero, Arain > 0
3. The calculated unavailability, p, should be in the range 0.001 ≤ p ≤ 10%
4. The pfd should be below the limits in Article **21**

Table 2: Generic link parameters of GSO links to be used in examination of the uplink (Earth-space) impact from a non-GSO network

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 1 | Generic Link Parameters = service |  |  |  |  |
|   | Link type | Link #1 | Link #2 | Link #3 |  |
| 1.1 | Frequency band (GHz) | 48 | 48 | 48 |  |
| 1.2 | ES EIRP (dBW/Hz) | 44 | 44 | 44 |  |
| 1.3 | Spot beam size (deg) | 0.3 | 0.3 | 0.3 |  |
| 1.4 | ITU-R S.672 sidelobe level (dB) | -25 | -25 | -25 |  |
| 1.5 | ES antenna efficiency | 0.6 | 0.6 | 0.6 |  |
| 1.6 | Additional link losses (dB) | 1 | 1 | 1 |  |
| 1.7 | Additional link margin (dB) | 3 | 3 | 3 |  |
|  |  |
| **2** | **Generic Link Parameters -Parametric Analysis**  | **Parametric Cases for Evaluation** |  |
| 2.1 | e.i.r.p. density variation | ± 3 dB from value in 1.2 |  |
| 2.2 | Elevation angle (deg) | 20, 55, 90 |  |
| 2.3 | 0.01% Rain Rate (mm/hr)  | 10, 50, 100 |  |
| 2.4 | Height of ES (m) | 0, 500, 1000 |  |
| 2.5 | Satellite noise temperature (K) | 250, 300 |  |
| 2.6 | Threshold C/N (dB) | 0, 2.5, 5, 10 |  |
|  |  |
| **3** | **Example Implementation – Link Calculation** | **First Case parametric cases taken for examples** | **Equations to Calculate Uplink Availability** |
| 3.1 | ES Peak gain (dBi) | 55.1 | 55.1 | 55.1 | $$G\_{max}=10log\_{10}\left(η\left(\frac{70π}{θ\_{3dB}}\right)^{2}\right)$$ |
|  | *Interim step: calculate the latitude corresponding with the elevation, ε* |  |  |  | $$ϕ=sin^{-1}\left(\frac{R\_{e}}{R\_{geo}}\sin(\left(\frac{π}{2}+ϵ\right))\right)$$ |
|  |  |  |  |  | $$Latitude=90-\left(ϕ+ϵ\right)$$ |
| 3.2 | Path length (km) | 39554.4 | 36780.4 | 39554.4 | $$D^{2}=R\_{e}^{2}+R\_{geo}^{2}-2R\_{e}R\_{geo}cos\left(latitude\right)$$ |
| 3.3 | Path loss (dB) | 216.4 | 215.8 | 216.4 | $$L\_{fs}=32.45+20log\_{10}\left(f\_{MHz}\right)+20log\_{10}\left(d\_{km}\right)$$ |
| 3.4 | Unfaded wanted single strength (dBW/MHz) | -118.4 | -117.7 | -118.4 | $$C\_{u}=EIRP-L\_{fs}+G\_{RX}-L\_{o}$$ |
| 3.5 | Noise plus margin (dBW/MHz) | -140.2 | -141.6 | -141.6 | $$N+M=10log\_{10}\left(T\right)+60-k+M\_{0}$$ |
|  |
| **4** | **Validation Checks** |  |
| 4.1 | Margin for rain fade (dB) | 11.8 | 23.3 | 23.3 | $$A\_{rain}=C\_{u}-\left(N+M\right)-T(\frac{C}{N})$$ |

The following checks are done to ensure the combination of Generic and Parametric Parameters are valid:

1. The rain margin should be greater than zero, Arain > 0
2. The calculated unavailability, p, should be in the range 0.001 ≤ p ≤ 10%

ANNEX 2 TO RESOLUTION [EUR-A16-SINGLE.ENTRY] (WRC-19)

Description of parameters and procedures for the evaluation of interference from a non-GSO system into global set of representative GSO links

This Annex provides the process to validate compliance with the single-entry permissible interference of a non-GSO system into GSO networks using the generic link parameters in Annex 1 and the worst-case geometry interference impact using the most recent version of Recommendation ITU-R S.1503. The procedure to determine the compliance with the single-entry permissible interference relies on the following principles.

*Principle 1*: The two time-varying sources of link performance degradation considered in the verification are link fading (from rain, cloud, gas and scintillation attenuation) plus the characteristics of the link and interference from other FSS or BSS networks.

The total *C*/*N* in the reference bandwidth for a given carrier is:

 $C/N=C/(N\_{T}+ I)$ (1)

where:

 *C*: wanted power (W) in the reference bandwidth, which varies as a function of fades and as a function of transmission configuration

 *NT* : total system noise (W) in the reference bandwidth (i.e. the thermal power)

 *I*: time-varying interference power (W) in the reference bandwidth generated by other networks.

*Principle 2*: The calculation of spectral efficiency is focused on satellite systems utilizing adaptive coding and modulation (ACM) by calculating the throughput degradation as a function of C/N, which varies depending on the long-term propagation and interference impacts on the satellite link.

*Principle 3*: During a fading event in the downlink direction, the interfering carrier is attenuated by the same amount as the wanted carrier. This results in some under-estimation of the total downlink degradation under circumstances where interference peaks and fading occur simultaneously.

By applying the following steps, the single-entry interference impact from a non-GSO system on the availability and spectral efficiency of a GSO link is determined. The generic GSO link parameters of Annex 1 are used, considering all possible parametric permutations, in conjunction with the worst case geometry (“WCG”) epfd output of Recommendation ITU-R S.1503. The generic link parameters of Annex 1 are used to create a global set of representative GSO link budgets. The output of Recommendation ITU-R S.1503 is a set of interference statistics that a non‑GSO system creates into each representative GSO link.

**For each generic GSO link from Annex 1:**

*Step 1*: Determine xfade,the probability distribution function (pdf) of the propagation fading plus other time variations in the characteristics of the generic GSO link. These statistics can be calculated using the procedures of the most recent version of Recommendation ITU-R P.618.

*Step 2*: Determine yint, the interference impact into the generic GSO link from the non-GSO system under examination using the procedures of Recommendation ITU-R S.1503.

*Step 3*: Determine zconv, a modified discrete convolution of the rain degradation pdf (xfade), with the interference degradation pdf (yint). For each pair of degradation values, *X* and *Y* from xfade and yint, respectively, the convolved degradation value is determined by the product of the xfade(*X*) and yint(*Y*) degradation values (or equivalently, the sum of the log values in dB) and the combined probability, computed as the product of each of the individual probabilities, is added to the appropriate convolved degradation pdf, zconv(*Z*).

Since the assumption of statistical independence between rain degradation (xfade) and interference degradation (yint) does not account for propagation effects on the interference path, a modification to the classic convolution for the downlink direction is proposed to account for this. This modified convolution is equivalent to a regular discrete convolution with the exception that the interference degradation values (yi) are first reduced by the applicable rain attenuation, i.e., the jth rain loss value, (LR)j, from the rain degradation pdf bin (xj) for which it is being combined.

The pdf of *zconv* is the modified convolution of the pdf of *xfade* and *yint* The total *C*/*N* degradation
*zconv* (dB) is therefore:

 *zconv* = *xfade* \* *yint*. (2)

*Step 4:* Using the results of the modified convolution procedures to obtain the pdf zconv described above for the total degradation for the propagation fade xfade and the interference impact from the non-GSO system (yint), the conditions for the single-entry case can be verified:

 *pz(zconv) = pxfade \* pyint* (3)

Conditions to be verified for compliance are:

 *U\_(R+I)<= 1.03 x U\_(R)* (4)

Where U\_(R+I) is the unavailability time due to rain and interference, U\_(R) is the unavailability time due to rain only. This formula should be applied for the short term performance objectives of generic GSO reference links

For the long term performance objective related to the spectral efficiency (SE) of the generic GSO links:

 (*SExfade* – *SEzconv*)/*SExfade*  [0.025] (5)

and

 $SE\_{i}=\sum\_{}^{}SE\_{i}\left(T\_{\%}\right)ΔT\_{\%}$ (6)

Where SExfade represents the operational capacity of the FSS link achieved due to propagation fading over a time period of one year and SEzfade+intf represents the operational capacity of the FSS link due to the combined mechanism of propagation and interference over a period of one year.

These equations represent the conditions to be checked to ensure that the percent degraded throughput caused by interference fades does not exceed a certain threshold, when compared to fades caused by propagation conditions over a long term period of operation.

This procedure is repeated for each generic GSO link from Annex 1, considering all parametric permutations and validation checks.

ANNEX 3 TO RESOLUTION [EUR-A16-SINGLE.ENTRY] (WRC-19)

Supplemental GSO reference links for evaluation of compliance with aggregate and operational limits for non-GSO systems

The data in Annex 3 are representative technical characteristics of GSO networks to be considered by administrations during the evaluation of the aggregate interference impact pursuant to No. **22.5M** and operational single-entry interference impact pursuant to No. **22.5N**.



**Editor´s Note:** The values contained in Annex 3 are provisional and are meant to be further reviewed and confirmed at WRC-19.

ADD EUR/16A6/13

Draft New Resolution [EUR-A16-AGG.SHARING] (WRC-19)

Protection of geostationary FSS, BSS and MSS networks from the aggregate interference produced by multiple non-GSO FSS systems in the 37.5-39.5 GHz, 39.5 42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz frequency bands

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

considering

*a)* that 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) are allocated, inter alia, on a primary basis to the fixed-satellite service (FSS) in all Regions;

*b)* that the frequency bands 40.5-41 GHz and 41-42.5 GHz are allocated, on a primary basis to the broadcasting-satellite service (BSS) in all Regions;

*c)* that the frequency bands 39.5-40 GHz and 40-40.5 GHz are allocated, on a primary basis to the mobile-satellite service (MSS) in all regions;

*d)* that Article **22** contains regulatory and technical provisions on sharing between geostationary-satellite orbit (GSO) and non-geostationary-satellite orbit (non-GSO) FSS systems in these bands in *considering* *a)*;

*e)* that, in accordance with No. **22.2**, non-GSO systems shall not cause unacceptable interference to GSO FSS and broadcasting-satellite service (BSS) networks and, unless otherwise specified in the Radio Regulations, shall not claim protection from GSO FSS and BSS satellite networks;

*f)* that non-GSO FSS systems would benefit from increased certainty that would result from the quantification of technical regulatory measures required for protection of GSO satellite networks operating in the bands referred to in *considering* *a)*, *b)* and *c)* above;

*g)* that GSO FSS, MSS, and BSS networks can be protected without placing undue constraints on non-GSO FSS systems in the bands in *considering a), b)* and *c)* above;

*h)* that WRC-19 modified Article **22** to limit single-entry and aggregate permissible time allowance for degradation in terms of C/N by non-GSO FSS systems to GSO satellite networks;

*i)* that the operating parameters and orbital characteristics on non-GSO FSS systems are usually inhomogeneous;

*j)* that, as a result of this inhomogeneity, the time allowance for the C/N value specified in the short-term performance objective associated with the shortest percentage of time (lowest C/N) or decrease of the long-term throughput (spectral efficiency) caused to reference GSO FSS links by non-GSO FSS systems is likely to vary between such systems;

*k)* that, the aggregate interference levels from multiple non GSO FSS systems will be related to the actual number of systems sharing a frequency band based on the single-entry operational use of each system;

*l)* that to protect GSO FSS, MSS, and BSS networks in the frequency bands listed in *considering* *a)*, *b)* and *c)* from unacceptable interference, the aggregate impact of interference caused by all co-frequency non-GSO FSS systems should not exceed the maximum aggregate impact specified in No. **22.5**M of the Radio Regulations;

*m)* that to achieve the level of protection of GSO reference links, administrations operating or planning to operate non-GSO FSS systems will need to agree cooperatively through consultation meetings;

*n)* that the aggregate level of the time allowance for the *C*/*N* value specified in the short-term performance objective associated with the shortest percentage of time (lowest *C*/*N*) of GSO reference link is likely to be the summation of single-entry levels caused by non-GSO FSS systems,

noting

*a)* that Resolution **[EUR-A16- SINGLE.ENTRY] (WRC-19)** contains the methodology for determining conformity to the single-entry limits to protect the GSO networks;

*b)* that Recommendation ITU-R S.1503 provides guidance on how to compute the epfd levels from a non-GSO system into GSO earth stations and satellites;

*c)* that Resolution **[EUR-A16- SINGLE.ENTRY] (WRC-19)** contains GSO satellite system characteristics to be used in non-GSO/GSO frequency sharing analyses in the frequency bands 37.5-39.5 GHz, 39.5 42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz,

recognizing

*a)* that non-GSO FSS systems may need to implement interference mitigation techniques, such as avoidance angles, earth station site diversity, and GSO arc avoidance to facilitate sharing frequencies among non-GSO FSS systems and to protect GSO networks;

*b)* that administrations operating or planning to operate non-GSO FSS systems will need to agree cooperatively through consultation meetings to share the aggregate interference impact allowance for all non-GSO FSS systems operating in the frequency bands listed in *considering* *a)*, *b)* and *c)* in a manner that achieves the level of protection for GSO FSS, MSS and BSS networks that is stated in No. **22.5M** of the Radio Regulations;

*c)* that administrations operating or planning to operate GSO FSS, MSS or BSS networks are invited to participate in the consultation meetings mentioned in *recognizing* *b)* above;

*d)* that, taking into account the single-entry allowance in No. **22.5L**, the aggregated impact of all non-GSO FSS systems can be computed without the need for specialized software tools based on the results of the single-entry impact for each system;

*e)* the need for administrations operating non-GSO FSS systems in the frequency bands listed in *considering* *a)* to agree cooperatively through consultation meetings takes on particular urgency whenever there could be aggregate interference at levels higher than the aggregate impact allowance from operational non-GSO FSS systems;

*f)* that representatives of administrations operating or planning to operate GSO FSS, MSS and BSS networks are encouraged to be involved in the determinations made pursuant to *recognizing b)*;

*g)* that 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), signals experience high levels of attenuation due to atmospheric effects such as rain, cloud cover and gaseous absorption;

*h)* that given these expected high levels of fading, it is desirable for GSO networks and non-GSO FSS systems to implement fade counter measures such as automatic level control, power control and adaptive coding and modulation,

resolves

1 that administrations operating or planning to operate non‑geostationary FSS systems in the frequency bands referred to in *considering a)* above, shall, in collaboration, take all necessary steps, including, if necessary, by means of appropriate modifications to their systems or networks, to ensure that the aggregate interference impact to geostationary FSS, MSS and BSS satellite networks caused by such systems operating co-frequency in these frequency bands does not exceed the aggregate limits specified in No. **22.5M**;

2 that to carry out the obligations in *resolves*1 above, administrations operating or planning to operate non-geostationary FSS systems shall agree cooperatively through regular consultation discussions referred to in *recognizing b)* to ensure that operations of all non-GSO networks do not exceed the aggregate level of protection for geostationary satellite networks;

3 that participation in the consultation process by administrations operating or planning to operate non-GSO FSS systems that are subject to this Resolution is required, and that failure by a responsible administration to participate in the consultation process does not relieve that administration of obligations under *resolves* 1 above, nor does it remove their systems from consideration in any aggregate calculations by the consultation group;

4 that *resolves 2 and 3* above begin to apply when a second non-geostationary FSS systems with frequency assignments in the frequency bands referred to in *considering a)* meets the criteria listed in Annex 2 to this Resolution;

5 that to carry out the obligations of *resolves 2* above*,* administrations shall use the generic GSO satellite characteristics listed in Resolution **[EUR-A16- SINGLE.ENTRY] (WRC‑19)** to determine the results of the aggregate impact to GSO networks;

6 that administrations (including representatives of administrations operating GSO FSS, MSS and BSS networks) participating in a consultation meeting are allowed to use their own software in conjunction with any software tools used by the BR for the calculation and verification of the aggregate limits, subject to the agreement of the consultation meeting;

7 that administrations, in carrying out their obligations under *resolves*1 above, shall take into account only those non-geostationary FSS systems with frequency assignments in the frequency bands referred to in *considering a)* above that have met the criteria listed in Annex 2 to this Resolution through appropriate information provided in the course of consultation discussions referred to in *resolves* 2;

8 that administrations, in developing agreements to carry out their obligations under *resolves*1 above, shall establish mechanisms to ensure that all potential FSS system and network notifying administrations and operators are given full visibility of and the opportunity to participate in the process;

9 that each administration, in the absence of an agreement reached at consultation meetings referred to in *resolves* 2, shall ensure that each of its non-geostationary FSS systems subject to this Resolution is operated in accordance with reduced single-entry interference impact allowances, calculated by the apportionment of the aggregate allowance commensurate to the number of simultaneously operating non-GSO systems, so as to ensure that the aggregate allowance in No. **22.5M** is not exceeded in operation;

10 that, in specific implementation of *resolves* 8above, if the consultation discussions show that there would be an exceedance of the aggregate allowance from non-GSO FSS systems in operation, every operational non-GSO FSS system shall reduce its emissions by means of appropriate modifications to their systems;

11 that the administrations participating at the consultation discussion referred to in *resolves 2* shall designate one convener to be responsible for communicating to the Bureau such as shown in Annex 1 that the results of the aggregate non-GSO system operational calculation and sharing determinations made in application of *resolves*1, 3 and 9 above, without regard to whether such determinations result in any modifications to the published characteristics of their respective systems providing a draft record of each consultation meeting, and posting the approved record,

invites the Radiocommunication Bureau

to participate in the consultation meetings in *resolves* 2 as an observer and to provide advice as necessary with respect to the results of the aggregate interference impact calculation performed according to *resolves*1,

invites the ITU Radiocommunication Sector

to continue its studies and to develop in time for WRC-23, as appropriate, a suitable methodology for calculating the aggregate interference produced by all non-GSO FSS systems operating or planning to operate co-frequency in the frequency bands referred to above into GSO FSS and GSO BSS networks, which may be used to determine whether the systems are in compliance with the aggregate limits specified in No. **22.5M**;

instructs the Radiocommunication Bureau

1 to publish in the International Frequency Information Circular (BR IFIC), the information referred to in *resolves* 11 along with the studies supporting the claim that the limits given in No. **22.5M** are met;.

2 to exclude the aggregate calculations given in No. **22.5M** as part of a satellite network examination under **11.31**,

urges administrations

to provide the Radiocommunication Bureau and all participants to the consultation meetings with the methodology, assumptions, inputs and results from the calculation performed under *resolves* 5.

ANNEX 1 TO DRAFT NEW
RESOLUTION [EUR-A16-AGG.SHARING] (WRC-19)

List of geostationary networks characteristics and format of the result of the aggregate calculation to be provided to BR for
publication for information

**I GSO network characteristics to be used in the calculation of aggregate emissions from non-GSO FSS systems**

I-1 GSO network Characteristics

The GSO network characteristics to be considered in the aggregate calculation are the:

− generic links contained in Annex 1 to Resolution **[EUR-A16-SINGLE.ENTRY] (WRC-19)**

− supplemental links contained in Annex 3 to Resolution **[EUR-A16-SINGLE.ENTRY] (WRC-19)**.

I-2 Non-GSO satellite system constellation parameters

For each non GSO satellite system, the following parameters should be provided to BR for publication in the aggregate calculation:

– Notifying administration;

– Number of space stations used in aggregate calculations;

– Single-entry contribution to the aggregate of each non-GSO FSS system.

**II Results of the aggregate epfd calculation**

– Single-entry use of each non-GSO FSS systems

- Detailed description of methodology used to calculate the aggregate interference

ANNEX 2 TO DRAFT NEW
RESOLUTION [EUR-A16-AGG.SHARING] (WRC-19)

List of criteria for the application of *resolves* 7

1 Submission of appropriate Coordination or Notification Information.

2 Entry into satellite manufacturing or procurement agreement, and entry into satellite launch agreement.

The non-geostationary FSS system operator should possess:

 i) evidence of a binding agreement for the manufacture or procurement of its satellites; and

 ii) evidence of a binding agreement to launch its satellites.

The manufacturing or procurement agreement should identify the contract milestones leading to the completion of manufacture or procurement of satellites required for the service provision, and the launch agreement should identify the launch date, launch site and launch service provider. The notifying administration is responsible for authenticating the evidence of agreement.

The information required under this criterion maybe submitted in the form of a written commitment by the responsible administration.

3 As an alternative to satellite manufacturing or procurement and launch agreements, evidence of guaranteed funding arrangements for the implementation of the project would be accepted. The notifying administration is responsible for authenticating the evidence of these arrangements and for providing such evidence to other interested administrations in furtherance of its obligations under this Resolution.

**Reasons:** Modify Article **22** to include a single-entry and aggregate interference limits, in order to protect GSO satellite networks from non-GSO FSS systems operating in the subject frequency bands and develop a new Resolution providing the procedure to ensure aggregate limits will not be exceeded.

ADD EUR/16A6/14

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

Compatibility between 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 1st January 2024 for earth stations operating with GSO networks to protect 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 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 1st of 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 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 station at WRC-23.