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| **42 MEETING OF PERMANENT****CONSULTATIVE COMMITTEE II:****RADIOCOMMUNICATIONS****August 28 to September 01, 2023****Ottawa, Canada** | **OEA/Ser.L/XVII.4.2.42****CCP.II-RADIO /doc. 5941/23****13 August 2023****Original: English** |
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|  | **PROPOSALS FOR THE WORK OF THE CONFERENCE AGENDA ITEM 10 - ARTICLE 22 EPFD LIMITS** |  |
|  | **(Item on the Agenda: 3.1 (SGT-5))** |  |
|  | **(Document submitted by the delegation of the United States of America)** |  |

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| **Impact on the sector:** |
| This document supports the work of CITEL’s PCC.II Working Group for WRC under 3.1 of the agenda. |

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| **Executive Summary:** |
| In the proposal below, the United States seeks a WRC-27 agenda item to study the regulatory provisions for frequency bands below 30 GHz contained in Article 22 with the goal of ensuring protection, from unacceptable interference to GSO FSS and BSS networks from NGSO FSS systems in the most spectrally efficient manner and establishing means to ensure that that NGSO FSS systems meet the single entry and aggregate limits. |

**UNITED STATES OF AMERICA**

**DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE**

Agenda Item 10

10 to recommend to the Council items for inclusion in the agenda for the next WRC, and items for the preliminary agenda of future conferences, in accordance with Article 7 of the Convention and Resolution 804 (Rev.WRC-19)

**WRC-27 agenda item to study and update, as appropriate, regulatory provisions for sharing between non‑GSO systems and GSO networks in frequency bands below 30 GHz in which No. 22 epfd limits apply**

**Background**

Recently, non-geostationary-satellite (“non-GSO”) systems in bands below 30 GHz have been deployed and are providing connectivity across the globe. They are capable of providing high speed, low latency broadband connectivity worldwide, including to locations where access to the internet was previously unreliable, or entirely unavailable. Publicly available data shows that non-GSO fixed-satellite service (“FSS”) systems serve well over one million users worldwide as of 2022 and are projected to serve at least tens of millions of users by 2030, resulting in enormous benefits to the global community. These unprecedented developments have dramatically changed the paradigm in satellite telecommunications.

GSO networks and NGSO systems rely entirely on shared spectrum to provide service, and efficient use of shared spectrum resources is one of the ITU pillars. To realize the full benefits and potential of non-GSO FSS systems, the ITU must ensure spectrally efficient access to co‑frequency spectrum resources for non-GSO systems and GSO networks, in accordance with the radio regulations including No. 22.2, while also increasing the efficiency of intra-service spectrum sharing through careful consideration of the ITU’s regulatory provisions.

Article **22** and Resolution 76 (Rev. WRC-15) of the Radio Regulations (RR) contain provisions that aim, in principle, to protect GSO FSS and GSO broadcasting satellite service (BSS) networks. Among these provisions are the uplink and downlink equivalent power flux-density (epfd↑ and epfd↓) limits that were adopted in 1997 and 2000. NGSO systems and GSO networks today have evolved in design and operational capabilities than the systems that were considered when developing the Article 22 epfd limits nearly twenty-five years ago. Additionally, our knowledge about how NGSO systems operate in practice has advanced significantly since that time.

With regard to compliance with current limits, the recent increase in the number of NGSO FSS, especially large constellations, has caused difficulties for the Bureau to examine compliance with the single-entry limits in Article **22** due to issues of modeling these constellations. Additionally, often NGSO FSS systems rely on multiple ITU filings, so examination of individual filings does not fully capture the complete NGSO FSS system or its impact on GSO networks. Moreover, the lack of methodologies, including one to accurately model non-GSO systems, has led to a situation where consultation meetings called for in Resolution **76** to ensure compliance with the aggregate epfd limits to protect GSO networks have not been held. This situation has raised uncertainty on the protection of GSO networks.

In the proposal below, the United States seeks a WRC-27 agenda item to study the regulatory provisions for frequency bands below 30 GHz contained in Article 22 with the goal of ensuring protection, from unacceptable interference to GSO FSS and BSS networks from NGSO FSS systems in the most spectrally efficient manner and establishing means to ensure that that NGSO FSS systems meet the single entry and aggregate limits.

ADD USA/10/1

DRAFT NEW RESOLUTION [USA-10-2027] (WRC‑23)

Agenda for the 2027 world radiocommunication conference

The World Radiocommunication Conference (Dubai, 2023),

considering

*a)* that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for a world radiocommunication conference (WRC) should be established four to six years in advance and that a final agenda shall be established by the ITU Council two years before the conference;

*b)* Article 13 of the ITU Constitution relating to the competence and scheduling of WRCs and Article 7 of the Convention relating to their agendas;

*c)* the relevant resolutions and recommendations of previous world administrative radio conferences (WARCs) and WRCs,

recognizing

*a)* that this conference has identified a number of urgent issues requiring further examination by WRC‑27;

*b)* that, in preparing this agenda, some items proposed by administrations could not be included and have had to be deferred to future conference agendas,

resolves

to recommend to the Council that a WRC be held in 2027 for a maximum period of four weeks, with the following agenda:

1 on the basis of proposals from administrations, taking account of the results of WRC‑23 and the Report of the Conference Preparatory Meeting, and with due regard to the requirements of existing and future services in the frequency bands under consideration, to consider and take appropriate action in respect of the following items:

1.x to study and update, as appropriate, regulatory provisions for the protection of GSO FSS and BSS networks from unacceptable interference from non-GSO FSS systems in the frequency bands below 30 GHz in which Article **22** epfd limits apply, and implementation of those provisions, in accordance with Resolution [EPFD REVISION] (WRC-23);

invites the ITU Council

to finalize the agenda and arrange for the convening of WRC‑27, and to initiate as soon as possible the necessary consultations with Member States,

instructs the Director of the Radiocommunication Bureau

1 to make the necessary arrangements to convene meetings of the Conference Preparatory Meeting (CPM) and to prepare a report to WRC‑27;

2 to submit a draft report on any difficulties or inconsistencies encountered in the application of the Radio Regulations referred in agenda item 9.2 to the second session of the CPM and to submit the final report at least five months before the next WRC,

instructs the Secretary-General

to communicate this Resolution to international and regional organizations concerned.

**Reasons:** To provide for studies to review and possibly revise, as appropriate, the regulatory provisions for protection of GSO FSS and BSS networks from unacceptable interference from non-GSO FSS systems in the frequency bands below 30 GHz in which Article **22** epfd limits apply, and the implementation of those provisions.

ADD USA/10/2

Draft New Resolution [EPFD REVISION] (WRC-23)

**Study of regulatory provisions for protection of GSO FSS and BSS networks from unacceptable interference from non-GSO FSS systems in the frequency bands below 30 GHz in which Article 22 epfd limits apply**

The World Radiocommunication Conference (Dubai, 2023),

considering

1. that systems based on the use of new technologies associated with both geostationary-satellite orbit (GSO) fixed-satellite service (FSS) and broadcasting-satellite service (BSS) networks and non-geostationary-satellite orbit (non-GSO) FSS constellations in frequency bands below 30 GHz in which Article 22 equivalent power flux-density (epfd) limits apply are capable of providing high-capacity and low-cost means of communication even to the most isolated regions of the world;
2. that the GSO orbit and its associated spectrum are a uniquely valuable resource that is heavily utilized around the world;
3. that non-GSO satellite orbit systems have been deployed recently in the bands referred to in *considering a)* above and that maximum efficient use of valuable spectrum resources should be ensured;
4. that Article 22.2 states that *Non-geostationary-satellite systems shall not cause unacceptable interference to and, unless otherwise specified in these Regulations, shall not claim protection from geostationary orbit satellite networks in the fixed satellite services and the broadcasting satellite service operating in accordance with these Regulations*
5. that there is a need to encourage the development and implementation of both GSO and non-GSO technologies to meet the growing demand for satellite services globally;
6. the need to encourage the development and implementation of both GSO and non-GSO technologies in the frequency bands below 30 GHz, in accordance with Radio Regulation 5.484;
7. that there is a need to ensure efficient use of co-frequency spectrum resources for non‑GSO FSS systems and GSO FSS and BSS networks;
8. that Article **22** and Resolution **76 (WRC-19)** of the Radio Regulations contains provisions that include uplink, downlink and inter-satellite equivalent power flux-density (epfd↑, epfd↓, and epfdis) limits; and that an administration operating a non-GSO FSS system in compliance with these limits is considered as having fulfilled its obligations under RR No. **22.2** ;
9. that any revision to Article 22 epfd limits must protect GSO FSS and BSS satellite networks consistent with RR No. 22.2;
10. that GSO and non GSO FSS systems may benefit from an updated review of the implementation of Article 22 epfd limits consistent with RR No. 22.2;
11. that the certainty of the interference environment provided by epfd limits has enabled technological advancements to date and appropriate limits will be critical for continued innovation in GSO and non-GSO networks and services;

recognizing

1. that the Article **22** and Resolution **76 (Rev.WRC-15)** epfd limits apply to non-GSO FSS systems to protect GSO FSS and BSS satellite networks from unacceptable interreference from non-GSO FSS satellite systems;
2. that non-GSO FSS systems and GSO FSS and BSS networks have evolved and implemented different technologies from the systems that were considered in 1997 and 2000 when the Article **22** epfd limits were adopted, and the knowledge about how non-GSO systems operate in practice has advanced significantly since then;
3. that the Article **22** epfd framework contains provisions to ensure protection from unacceptable interference from non-GSO systems into GSO networks;
4. that WRC-2000 agreed that additional protection above that provided by the epfd↓ limits in the portions of the 30/20 GHz frequency bands in which Article **22** epfd limits apply is required for certain GSO FSS networks with specific receive earth stations with very large antennas;
5. that, in order to provide this additional protection, WRC-2000 adopted a procedure for identifying the need for coordination under Nos. **9.7A** and **9.7B**;
6. that the earth stations registered under RR Nos. **9.7A** and **9.7B** are associated with GSO satellite networks that have been filed, and are operating with, non-zero inclination;
7. that the procedure for identifying the need for coordination under Nos. **9.7A** and **9.7B** is based on bandwidth overlap and the conditions specified in Appendix **5** for the GSO FSS earth station antenna maximum isotropic gain, *G*/*T* and emission bandwidth and the epfd↓ radiated by the non-GSO FSS satellite system into the earth station employing the very large antenna;
8. that WRC-2000 indicated that the results of the coordination examination under Nos. **9.7A** and **9.7B** would have no impact on the determination of whether a non-GSO system met the epfd limits in the portions of the 30/20 GHz frequency bands in which the Article **22** limits apply;

i) that Recommendation ITU-R S.1503 provides a specification for a software simulation tool for calculating epfd↓ as a function of time, however this Recommendation does not take into account the inclination of a GSO satellite for determining the need for coordination under Nos. **9.7A** and **9.7B**;

1. that in accordance with *recognizing c-g*, Recommendation ITU-R S.1714 provides a static methodology for calculating epfd↓ to facilitate identifying the need for coordination of very large antennas under Nos. **9.7A** and **9.7B;**
2. that Recommendation ITU-R S.1323 provides information on operational requirements and protection criteria that may be used in epfd sharing studies;
3. that Article **22** and Resolution **76 (Rev.WRC-15)** epfd limits were derived taking into account only a short-term protection criterion;

*n)* that WRC‑19 adopted No. **22.5L** and No. **22.5M** for the 50/40 GHz bands, which is an alternative protection framework for GSO FSS networks;

*o)* that the approach for the 50/40 GHz bands referred to *recognizing n),* or other approaches to resolve specific issues identified with the current epfd limits, including modifying the existing epfd limits, could be considered in studies to ensure the protection of GSO FSS and BSS networks from unacceptable interference as required by RR No. **22.2**;

p) that there are currently both GSO FSS and BSS networks and non-GSO FSS systems filed and operating in the frequency bands subject to Article 22 epfd limits and any change to this framework may require transitional measures in order not to disrupt these services and to take due regard of the requirements of these existing and planned GSO networks;

q) that Resolution **76 (Rev.WRC-15)** includes aggregate epfd limits that apply to operational non-GSO FSS systems to protect GSO FSS and BSS satellite networks from unacceptable interference from all co-frequency operational non-GSO FSS systems;

r) that Resolution **76 (Rev.WRC-15)** aggregate epfd limits are not examined by the Bureau as they are considered operational limits, however there are no agreed methodologies to compute the aggregate interference or how to address cases where the aggregate epfd limits are exceeded and this results in uncertainty for GSO networks;

s) that there may be a need to improve the ability to measure non-GSO operational parameters that ensure the protection of GSO networks;

t) that GSO networks have limited capability to avoid interference from non-GSO systems

recognizing further

1. that the single-entry Article **22** epfd limits that must be met by non-GSO FSS systems were derived to protect GSO FSS and BSS satellite networks from unacceptable interference, as Article **21** limits apply for protection of terrestrial services;
2. that there have been difficulties experienced regarding examination of compliance with the single-entry epfd limits due to issues of modelling complex non-GSO constellations and reliance on multiple ITU filings by one non-GSO system;
3. that the consultation meetings called for in Resolution 76 have not occurred due to lack of methodologies called for in the invites the ITU-R of Resolution 76, including one to address cases where the aggregate epfd limits are exceeded and one for developing detailed modelling of non-GSO systems;

resolves to invite ITU-R

1. to conduct, and complete in time for WRC-27, studies of the current regulatory provisions for non-GSO FSS systems to protect GSO FSS and BSS networks from unacceptable interference in the frequency bands below 30 GHz where Article **22** epfd limits apply, including evaluation by administrations of the aggregate epfd limits in Resolution **76 (Rev.WRC-15)**, and the implementation of those regulatory provisions, without modifying the requirements or conditions for coordination under Nos. **9.7A** and **9.7B**, with the objective of protecting GSO networks in accordance with No. 22.2 and improving efficient use of the spectrum resource;
2. to develop, based on the results of the studies referred to in *resolves* 1, and as appropriate, modifications to the regulatory provisions for non-GSO FSS systems to protect GSO FSS and BSS networks from unacceptable interference in the frequency bands below 30 GHz where Article **22** epfd limits apply, or replacement of the epfd framework with another approach and development of associated limits, in accordance with No. **22.2**;
3. to ensure that continuity of operations of existing and planned GSO networks and non-GSO systems is not disrupted, through developing transitional measures as needed;
4. to ensure the protection of incumbent and filed GSO networks as required by the ITU Radio Regulations;

5 to complete by WRC-27, development of a methodology for accurately modelling non-GSO systems and calculating the aggregate epfd produced by all non-GSO FSS systems operating co-frequency to protect GSO FSS and BSS networks from unacceptable interference and other necessary elements required for administrations to hold consultation meetings to confirm compliance with the aggregate epfd limits;

6 to develop as soon as possible, based on the results of studies in *resolves* 1-2 any additional methodologies or tools that may be required for the Bureau to examine non-GSO system filings for compliance with single entry epfd limits;

7 to study and identify means to ensure that single-entry limits to protect GSO networks are applied per complete system and not per individual filing;

 *invites the 2027 World Radiocommunication Conference*

to consider the results of the above studies and take necessary regulatory actions, as appropriate;

**Reasons:** To provide for studies in frequency bands below 30 GHz where epfd limits apply to review and revise, as appropriate the epfd limits applicable to non-GSO FSS systems and associated regulatory provisions while ensuring protection of GSO FSS and BSS networks from unacceptable interference and maximizing spectral efficiency to enable global satellite services with modern satellite networks to ensure the protection from unacceptable interference of incumbent and planned GSO networks as required by the ITU Radio Regulations and develop as needed transitional measures, such as grandfathering, to ensure continuity of operations of existing and planned GSO networks and non-GSO systems are not disrupted;

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**ATTACHMENT**

**Proposal for future agenda item to study and update, as appropriate, the regulatory provisions for the protection of GSO FSS and BSS networks from unacceptable interference from non-GSO FSS systems in frequency bands below 30 GHZ in which Article 22 epfd limits apply**

**Subject**:Proposed future WRC-27 agenda item to study regulatory provisions for protection of GSO FSS and BSS networks from non-GSO systems in frequency bands below 30 GHz in which Article 22 epfd limits apply, and the implementation of those provisions;

**Origin**: United States of America

*Proposal: To study and update, as appropriate, regulatory provisions for sharing between non GSO systems and GSO networks in the portions of the frequency bands below 30 GHz in which Article* ***22*** *epfd limits apply, and the implementation of those provisions.*

***Background/reason****: NGSO and GSO networks today have evolved in design and operational capabilities from the systems that were considered when developing the Article 22 epfd limits nearly twenty-five years ago. Equally important the tools and methodologies for examination of single-entry and aggregate EPFD limits to protect GSO networks are not fully available. Thus a comprehensive study is needed to determine if updates to the protection levels are required, and make changes as appropriate to ensure maximum spectral efficiency to meet the growing demand for satellite services globally.*

***Radiocommunication services concerned****:***[**Fixed Satellite Service, Mobile Satellite Service, BSS, EESS, Radio Astronomy and other services]

***Indication of possible difficulties****:* [ ]

***Previous/ongoing studies on the issue****:* [ ]

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| ***Studies to be carried out by: [WP4A]*** | *with the participation of:*  Administrations and Sector members of the ITU-R |

***ITU-R Study Groups concerned****:* ***[SG4]***

***ITU resource implications, including financial implications (refer to CV126)****:* This proposed agenda item will be studied within the normal ITU-R procedures and planned budget.

***Common regional proposal****:* Yes/No ***Multicountry proposal:*** Yes/No

 *Number of countries:*

***Remarks***