# UNITED STATES OF AMERICA

# DRAFT PROPOSALS FOR THE WORK OF THE CONFERENCE

**AGENDA ITEM 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);***

**BACKGROUND INFORMATION**:

Article **22** of the Radio Regulations contains provisions to ensure compatibility of non-GSO FSS operations with GSO networks. There are currently no defined technical provisions for sharing between non-GSO systems and GSO networks in the 50/40 GHz frequency bands. Moreover, there are no existing mechanisms in the RR establishing coordination procedures applicable to non-GSO systems operating within the FSS allocations in frequency bands in the 37.5 to 51.4 GHz range, such as application of RR No. **9.12**. This also contributes to uncertainty among potential operators of non-GSO satellite systems in these bands.

To address these issues, WRC-15 established agenda item 1.6 for WRC-19: “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)**” which invites the ITU-R membership to contribute to “Studies of technical, operational issues and regulatory provisions for non-GSO fixed-satellite services satellite systems 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).”

Non-GSO FSS systems in the 50/40 GHz band can be utilized to unlock a new and promising source of global broadband communications. Recent advances in satellite design, launch service capabilities and user terminal technology make it feasible to provide global satellite broadband services. Thanks to these recent technological advances, next-generation non-GSO satellite systems are currently being developed. These systems can greatly enhance the efficient use of existing FSS spectrum by using next-generation satellite and earth station technology. The benefits of such non-GSO satellite systems include providing worldwide connectivity and high-quality communication services to users in all geographic settings, be they urban, rural or remote, and offer tools for definitively addressing the longstanding broadband gap. Developing a regulatory framework in the 50/40 GHz band will provide regulatory certainty to allow non-GSO satellite systems to efficiently operate in these existing FSS frequency bands.

ITU-R studies have concluded that sharing between non-GSO and GSO FSS systems is possible in these frequency bands. ITU-R Working Party 4A has also been working on the development of a new Recommendation to identify means and a methodology to define a protection criteria for sharing by FSS systems in the 50/40 GHz bands. The methodology in this Recommendation and proposed protection criteria considers both the short term performance objectives and long term time-average bandwidth efficiency to enable use of these frequency bands by non-GSO FSS systems that will ensure protection of GSO FSS networks. ITU-R studies have confirmed that the application of the procedures in the new Recommendation allows for flexibility in the design and operation of non-GSO systems, while fully protecting GSO operations, therefore significantly enhancing spectrum efficiency for FSS networks in the 50/40 GHz bands.

This proposal presents a regulatory framework for providing certainty and technical provisions to allow for sharing between non-GSO and GSO systems. This framework has been developed based on sharing study results in ITU-R WP4A to identify a methodology to allow for maximum spectrum efficiency for both non-GSO and GSO FSS systems, while providing for protections for operations of GSO FSS systems from operations of non-GSO networks. Additionally, this framework provides a methodology to ensure that aggregate emissions from operating non-GSO networks do not exceed aggregate protection requirements of GSO FSS systems.

**Proposal:**

ARTICLE 5

**Frequency allocations**

**Section IV – Table of Frequency Allocations**

**MOD USA/1.6/1**

|  |  |  |
| --- | --- | --- |
| 34.2-40 GHz | | |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 37.5-38 FIXED  FIXED-SATELLITE (space-to-Earth) ADD 5.484A  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 5.484A  MOBILE  Earth exploration-satellite (space-to-Earth)  5.547 | | |
| 39.5-40 FIXED  FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5.484A  MOBILE  MOBILE-SATELLITE (space-to-Earth)  Earth exploration-satellite (space-to-Earth)  5.547 | | |

|  |  |  |
| --- | --- | --- |
| 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 5.484A  MOBILE  MOBILE-SATELLITE (space-to-Earth)  SPACE RESEARCH (Earth-to-space)  Earth exploration-satellite (space-to-Earth) | | |
| 40.5-41  FIXED  FIXED-SATELLITE  (space-to-Earth)  BROADCASTING  BROADCASTING-SATELLITE  Mobile  5.547 | 40.5-41  FIXED  FIXED-SATELLITE  (space-to-Earth) 5.516B ADD 5.484A  BROADCASTING  BROADCASTING-SATELLITE  Mobile  Mobile-satellite (space-to-Earth)  5.547 | 40.5-41  FIXED  FIXED-SATELLITE  (space-to-Earth)  BROADCASTING  BROADCASTING-SATELLITE  Mobile  5.547 |
| 41-42.5 FIXED  FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5.484A  BROADCASTING  BROADCASTING-SATELLITE  Mobile  5.547 5.551F 5.551H 5.551I | | |
| 47.2-47.5 FIXED  FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.484A  MOBILE  5.552A | | |

|  |  |  |
| --- | --- | --- |
| 47.5-51.4 GHz | | |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 47.5-47.9  FIXED  FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.484A (space-to-Earth) 5.516B 5.554A ADD 5.484A  MOBILE | 47.5-47.9  FIXED  FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.484A  MOBILE | |
| 47.9-48.2 FIXED  FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.484A  MOBILE  5.552A | | |
| 48.2-48.54  FIXED  FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.484A (space-to-Earth) 5.516B 5.554A 5.555B  MOBILE | 48.2-50.2  FIXED  FIXED-SATELLITE (Earth-to-space) 5.516B 5.338A 5.552 ADD 5.484A  MOBILE | |
| 48.54-49.44  FIXED  FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.484A  MOBILE  5.149 5.340 5.555 |  | |
| 49.44-50.2  FIXED  FIXED-SATELLITE (Earth-to-space) 5.338A 5.552 ADD 5.484A (space-to-Earth) 5.516B 5.554A 5.555B ADD 5.484A  MOBILE | 5.149 5.340 5.555 | |
| 50.4-51.4 FIXED  FIXED-SATELLITE (Earth-to-space) 5.338A ADD 5.484A  MOBILE  Mobile-satellite (Earth-to-space) | | |

**5.484A** The use of the bands 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.75 GHz (space-to-Earth) in Region 3, 12.5‑12.75 GHz (space-to-Earth) in Region 1, 13.75-14.5 GHz (Earth-to-space), 17.8-18.6 GHz (space-to-Earth), 19.7-20.2 GHz (space-to-Earth), 27.5-28.6 GHz (Earth-to-space), 29.5-30, GHz (Earth-to-space), 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 application of the provisions of No. **9.12** for coordination with other non-geostationary-satellite systems in the fixed-satellite service. Non-geostationary-satellite systems in the fixed-satellite service shall not claim protection from geostationary-satellite networks in the fixed-satellite service operating in accordance with the Radio Regulations, irrespective of the dates of receipt by the Bureau of the complete coordination or notification information, as appropriate, for the non-geostationary-satellite systems in the fixed-satellite service and of the complete coordination or notification information, as appropriate, for the geostationary-satellite networks, and No. **5.43A** does not apply. Non-geostationary-satellite systems in the fixed-satellite service in the above bands shall be operated in such a way that any unacceptable interference that may occur during their operation shall be rapidly eliminated. (WRC-19)

**Reasons:** To address coordination among non-GSO FSS systems in the 50/40 GHz bands

**ADD USA/1.6/2**

ARTICLE 22

**Space services**

**ADD**

**22.5L** 9) The operation of any 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 permissible allowance of 3% of time allowance for degradation in terms of C/N of GSO FSS networks. The calculation procedures given in Resolution **[Agg Sharing]** (WRC-19) shall be used for the calculation of the 3% single-entry operational allowance.

**ADD**

**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, 39.5-42.5, 47.2-50.2, and 50.4-51.4 GHz shall apply the provisions of Resolution **[AGG Sharing] (WRC-19)** to ensure that the aggregate interference of 10% into geostationary fixed-satellite service networks caused by non-geostationary-satellite systems operating in these frequency bands does not exceed the total aggregate limits.

**Reasons:** Based on ITU-R studies, the detailed technical regulatory provisions presented above will introduce regulatory provisions into the Radio Regulations that will enable the introduction of non-GSO satellite systems that will protect GSO systems and provide for maximum spectral efficiency for FSS operations in the 50/40 GHz bands.

**ADD**

RESOLUTION [AGG sharing] (WRC‑19)

**Protection of geostationary satellite networks from the aggregate equivalent power flux-density produced by non-geostationary satellite networks and 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 (2019),

*considering*

*a)* that the frequency bands 37.5-39.5, 39.5-42.5, 47.2-50.2 (Earth-to-space), and 50.4-51.4 GHz are allocated, *inter alia*, on a primary basis to the fixed-satellite service (FSS) in all Regions;

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

*c)* 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;

*d*) that non-GSO FSS systems would benefit from the certainty that would result from the

specification of regulatory measures required to protect GSO FSS and BSS satellite networks under No. 22.2;

*e)* that the Radio Regulations should enable the introduction of new applications of radiocommunication technology to ensure the operation of as many systems as possible in order to ensure efficient use of spectrum;

*f)* that GSO FSS systems can be protected without placing undue constraints on non-GSO FSS systems in the bands in *considering a)*;

*g)* that single-entry and aggregate limits for the protection of GSO networks from non-geostationary FSS satellite systems are contained in Recommendation ITU-R S.[50/40 GHz sharing];

*h)* that Article **22** ensures that the limits contained therein provide adequate protection to GSO systems without placing undue constraints and promoting maximum spectrum efficiency on any of the systems and services sharing the bands in *considering a)*;

*i)* that this conference modified Article **22** to include single-entry and aggregate permissible time allowances for degradation in terms of C/N of GSO FSS networks in the bands in *considering a)*;

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

*k)* that the aggregate interference caused by all co-frequency non-GSO FSS systems into these bands into GSO FSS systems should not exceed the aggregate limits given in Recommendation ITU-R S.[50/40 GHz FSS Sharing Methodology] *recommends* 3;

*recognizing*

*a)* that non-geostationary FSS systems are likely to need to implement interference mitigation techniques to mutually share frequencies;

*b)* that the coordination provision of No. **9.12** applies to non-geostationary FSS networks or systems in the frequency bands in *considering a)*;

*noting*

1. that Recommendation ITU‑R S.[50/40 GHz FSS sharing] contains the methodology to calculate the single-entry and aggregate protection limits and the methodology for determining conformity to these limits to protect the GSO;
2. that Recommendation ITU-R S.1503 provides recommendations on how to compute the EPFD from a non-GSO system into victim earth stations and satellites;
3. that Recommendation ITU-R S.[50/40 GHz FSS Reference Links] contains GSO satellite system characteristics to be considered in frequency sharing analyses;

*resolves*

1 that to achieve the objectives of *considerings i)*, 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 single entry allowable unavailability limit for each non-geostationary FSS system does not exceed 3% and aggregate interference into geostationary FSS satellite networks caused by such systems operating co-frequency in these frequency bands does not cause exceedance of 10% of the aggregate limits given in Recommendation ITU-R S.[50/40GHz sharing]

2 that, in the event that the aggregate interference levels are exceeded, administrations operating non‑geostationary FSS systems in these frequency bands shall expeditiously take all necessary measures to reduce the aggregate epfd levels;

3 that to carry the obligations in *resolves*1 and 2 above, administrations operating or planning to operate non-geostationary FSS systems will need to agree cooperatively through regular consultation discussions to ensure that operations of non-GSO networks do not exceed the aggregate level of protection for geostationary FSS satellite networks;

4 that to carry out the calculation of *resolves 3,* administrations shall take into account the GSO FSS satellite characteristics listed in Recommendation ITU-R S.[50/40 GHz Reference Links] when applying the methodology contained in Recommendation ITU-R S.[50/40 GHz sharing methdology] and the epfd calculation procedures given in Recommendation ITU-R S.1503;

5 that administrations, in carrying out their obligations under *resolves*1 and 2 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 to consultation discussions referred to in *resolves* 3;

6 that administrations, in developing agreements to carry out their obligations under *resolves*1 and 2 above, shall establish mechanisms to ensure that all potential non-geostationary FSS system notifying administrations and operators are given full visibility of the process;

7 that in the absence of an agreement reached at consultation discussions referred to in *resolves* 3, each non-geostationary FSS system shall be operated in accordance with single-entry epfd limits calculated by the apportionment of the aggregate levels commensurate to the number of non-GSO systems operating so as to assure equitable sharing of the aggregate limit among all non-GSO systems in operation;

8 that the administrations participating at the consultation discussion referred to in *resolves 3* shall designate one administration that shall communicate 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 above, without regard to whether such determinations result in any modifications to the published characteristics of their respective systems;

*instructs the Radiocommunication Bureau*

1 to observe and monitor the single entry unavailability contribution of each non-geostationary-satellite system and the results of the aggregate epfd calculation performed according to *resolves*1;

2 to publish in the International Frequency Information Circular (BR IFIC), the information referred to in *resolves*8,

ANNEX 1 TO RESOLUTION [AGG\_SHARING] (WRC-19)

List of GSO FSS system characteristics and format of the result of   
the aggregate calculation to be provided to BR for   
publication for information

1. 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:

* + - System administration
    - Number of space stations used in aggregate calculation
    - Single entry use of each non-GSO FSS systems

2. Results of the aggregate epfd calculation

ANNEX 2 TO RESOLUTION [AGG\_EPFD] (WRC-19)

**List of criteria for the application of *resolves* 3**

1 Submission of appropriate Notification Publication Information.

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

The non-geostationary FSS system operator should possess:

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

ii) clear 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 may be submitted in the form of a written commitment by the responsible administration.

3 As an alternative to satellite manufacturing or procurement and launch agreements, clear evidence of guaranteedfunding 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:** To provide a methodology to ensure that aggregate GSO protection levels are never exceeded and to provide a mechanism to monitor the aggregate epfd limits from the operation of actual non-GSO systems

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