

## RESOLUTION 769 (WRC-19)

**Protection of geostationary fixed-satellite service, broadcasting-satellite service and mobile-satellite service networks from the aggregate interference produced by multiple 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 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);
- 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);
- c) that the frequency bands 39.5-40 GHz (space-to-Earth) and 40-40.5 GHz (space-to-Earth) are allocated on a primary basis to the mobile-satellite service (MSS);
- d) that Article 22 contains regulatory and technical provisions on sharing between geostationary-satellite (GSO) and non-geostationary-satellite (non-GSO) FSS systems in the frequency bands referred to in *considering a)*;
- e) that, in accordance with No. 22.2, non-GSO systems shall not cause unacceptable interference to GSO FSS and GSO BSS networks and, unless otherwise specified in the Radio Regulations, shall not claim protection from GSO FSS and GSO BSS networks;
- f) that administrations planning to operate non-GSO FSS systems require quantification of the technical regulatory measures required for protection of GSO FSS, GSO MSS and GSO BSS networks operating in the frequency bands referred to in *considering a), b) and c)* above;
- g) that the operating parameters and orbital characteristics of non-GSO FSS systems are usually inhomogeneous;
- h) that 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, GSO MSS and GSO BSS links by non-GSO FSS systems is likely to vary according to the parameters of such systems;
- i) that the aggregate interference 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;
- j) that, to protect GSO FSS, GSO MSS and GSO 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 shall not exceed the aggregate impact limit specified in No. 22.5M;

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*k)* that the aggregate levels are likely to be the summation of worst-case single-entry levels of interference caused by non-GSO FSS systems,

*noting*

*a)* that Resolution **770 (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 equivalent power flux-density (epfd) levels from a non-GSO system into GSO earth stations and satellites;

*c)* that Resolution **770 (WRC-19)** contains GSO 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 FSS, GSO MSS and GSO BSS 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 allowance for all non-GSO FSS systems sharing the frequency bands listed in *considering a)* in order to achieve the desired level of protection for GSO FSS, GSO MSS and GSO BSS networks that is stated in No. **22.5M**;

*c)* that administrations operating or planning to operate GSO FSS, GSO MSS or GSO BSS networks are invited to participate and be involved in the consultation meetings mentioned in *recognizing b)* above, especially as the aggregate interference level approaches the limits specified in No. **22.5M**;

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

*e)* 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;

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

*resolves*

1 that administrations operating or planning to operate non-GSO FSS systems in the frequency bands referred to in *considering a)* above shall jointly take all necessary steps, including, if necessary, appropriate modifications to the operational characteristics of their systems or networks, to ensure that the aggregate interference impact to GSO FSS, GSO MSS and GSO BSS 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-GSO FSS systems shall agree cooperatively through the regular consultation discussions referred to in *recognizing b)* to ensure that operations of all non-GSO FSS networks do not exceed the aggregate level of protection for GSO networks;

3 that, taking into account *resolves 2*, failure by a responsible administration operating or planning to operate non-GSO FSS systems 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-GSO FSS system 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 in *resolves 1* above, administrations shall use the generic GSO reference links listed in Resolution **770 (WRC-19)** and validated supplemental GSO links associated with notified and brought-into-use frequency assignments submitted to the Radiocommunication Bureau (BR) by administrations to determine the results of the aggregate impact on GSO networks;

6 that administrations (including representatives of administrations operating GSO FSS, GSO MSS and GSO BSS networks) participating in a consultation meeting are allowed to use their own software in conjunction with any software tools used by 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-GSO 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 the consultation discussions referred to in *resolves 2*;

8 that administrations, in developing agreements to carry out their obligations under *resolves 1*, shall establish mechanisms to ensure that all notifying administrations and operators that are planning to operate FSS, BSS and MSS systems and networks are given full visibility of, and the opportunity to participate in, the consultation process, either in person or remotely, regardless of the stage of development and deployment of these systems and networks;

9 that, taking into account *resolves 2*, a responsible administration operating or planning to operate non-GSO FSS systems that is unable to participate in the consultation process, either in person or remotely, is still responsible for meeting its obligations under *resolves 1* above and for providing information on its systems so that they may be included in the aggregate calculations by the consultation group;

10 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-GSO FSS systems subject to this Resolution are operated in accordance with reduced single-entry interference impact allowances, calculated by an amount proportional to their single-entry contribution to the aggregate, so as to ensure that the aggregate allowance in No. **22.5M** is not exceeded;

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11 that the administrations participating in the consultation discussion referred to in *resolves 2* shall designate one convener to be responsible for communicating to BR 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 providing BR with the approved record, as specified in Annex 1 to this Resolution,

*invites administrations*

to submit to BR, as necessary, supplemental GSO links, in a format consistent with the generic links in Annex 1 to Resolution **770 (WRC-19)**, and in the frequency bands listed in *considering a)*, that are associated with GSO networks,

*invites the Radiocommunication Bureau*

to participate in the consultation meetings in *resolves 2* as an observer,

*invites the ITU Radiocommunication Sector*

1 to carry out studies and develop, as a matter of urgency, a suitable methodology, considering a range of input values and assumptions, including both best and worst case, for calculating the aggregate interference produced by all non-GSO FSS and as appropriate non-GSO MSS systems operating or planning to operate in the frequency bands referred to above co-frequency with GSO FSS, GSO MSS 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**;

2 to carry out studies and develop, as a matter of urgency a methodology to validate supplemental GSO links;

3 to study the selection and use of *C/N* objectives, and the necessity of specifying one or more *C/N* objective points at associated percentages of time, with regard to the GSO link performance;

4 to report back to a future world radiocommunication conference, as appropriate, under Resolution **86 (Rev.WRC-07)**,

*instructs the Radiocommunication Bureau*

1 to collect and, once a methodology is available, evaluate for validation purposes and provide for information the supplemental GSO links submitted by administrations for frequency assignments associated with GSO networks;

2 to provide the consultation meeting, for use in the aggregate calculations, with the validated supplemental GSO links associated with networks brought into use;

3 to make available on the ITU website within one month from the closing date of any consultation meeting all information, such as that in Annex 2, referred to in *resolves 11*;

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

## ANNEX 1 TO RESOLUTION 769 (WRC-19)

**List of geostationary-satellite network characteristics and format of the result of the aggregate calculation to be provided to the Radiocommunication Bureau for publication for information**

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

**I-1 GSO FSS, GSO MSS and GSO BSS network characteristics**

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

- generic links contained in Annex 1 to Resolution **770 (WRC-19)**.

**I-2 Non-GSO FSS system constellation parameters**

For each non-GSO 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 efd calculation**

- summary record of the meeting;
- single-entry contribution of each non-GSO FSS system;
- detailed description of methodology used to calculate the aggregate interference;
- the aggregate assessment of the non-GSO systems on the generic and validated supplemental GSO links, if any;
- all input materials submitted to the meeting; and
- studies conducted prior to or at the meeting as well as any other materials deemed necessary for demonstrating compliance with No. **22.5M**.

ANNEX 2 TO RESOLUTION 769 (WRC-19)

**List of criteria for the application of *resolves* 7**

1 Submission of appropriate coordination and/or notification information for non-GSO FSS systems.

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 an 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, 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.