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| A close up of a sign  Description automatically generated | **World Radiocommunication Conference (WRC-23)Dubai, 20 November - 15 December 2023** |  |
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| PLENARY MEETING | **Addendum 17 toDocument 148-E** |
|  | **25 October 2023** |
|  | **Original: English** |
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| Iran (Islamic Republic of) |
| PROPOSALS FOR THE WORK OF THE CONFERENCE |
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| Agenda item 1.17 |

1.17 to determine and carry out, on the basis of ITU‑R studies in accordance with Resolution **773 (WRC‑19)**, the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate;

Introduction

WRC‑23 agenda item 1.17 focuses on identifying and implementing suitable regulatory measures for establishing inter-satellite links in specific frequency bands or parts thereof. This process is based on ITU‑R studies conducted under Resolution **773 (WRC‑19)**. The objective is to facilitate inter-satellite communication by potentially allocating dedicated frequency segments for this purpose. Resolution **773 (WRC-19)** specifically addresses technical, operational and regulatory considerations for satellite-to-satellite links in the frequency ranges of 11.7-12.7 GHz, 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz. During the conference, administrations and experts collaborate to assess the outcomes of these studies and determine appropriate regulatory actions, which may involve introducing inter-satellite service allocations as needed. This agenda item's deliberations are critical for advancing satellite technology and enhancing global satellite networks capabilities through improved inter-satellite communication.

There are two methods to satisfy WRC‑23 agenda item 1.17:

i) Method A;

ii) Method B.

In the proposed regulatory text, the two alternatives on the type of allocation are referred as:

*• Alternative FSS*: addressing an FSS (space-to-space) allocation;

*• Alternative GSO within cone*: addressing “within the cone” concept for GSO service provider;

and the two possible sharing mechanisms with non-GSO FSS systems are referred as both:

*• Alternative non-GSO FSS coordination*: addressing the sharing with non-GSO FSS through a RR No. **9.12** coordination with space-to-space emissions;

*• Alternative non-GSO FSS hard limit*: addressing the sharing with non-GSO FSS through hard limits with space-to-space emissions.

Within Method B there are several options that should be considered within each of the alternatives for necessary provisions to ensure the protection of incumbent services.

The example regulatory text included with the Method offers provisions in a Resolution to ensure protection of the incumbent services. The Resolution includes five Annexes as follows:

*•* Annex 1 to the draft Resolution addresses the concept of operation;

*•* Annex 2 to the draft Resolution addresses the terrestrial protection;

*•* Annex 3 to the draft Resolution addresses the EESS (passive) protection;

*•* Annex 4 to the draft Resolution addresses the non-GSO systems protection;

*•* Annex 5 to the draft Resolution addresses the GSO FSS networks protection.

These Annexes are not contained/attached to these proposals as they need to be carefully examined, verified and agreed upon.

Proposals

This Administration proposes that:

1 Satellite-to-satellite link transmissions should comply with the same directionality indicators as in the existing FSS allocations (Earth-to-space = from user space station to service provider space station, space-to-Earth = from service provider space station to user space station).

2 The use of these bands for satellite-to-satellite links needs to fully protect the FSS in these bands, taking into account that the parts of these frequency bands studied under the agenda item are the core FSS bands which are used for telecommunication infrastructure in many countries, in particular, in the developing and least developed countries. The following should therefore be included in the corresponding Resolution relating to GSO FSS (see Annex 1):

2.1 The assignments pertaining to ISS subject to this agenda item, if concluded at WRC‑23, shall not cause unacceptable interference to nor claim protection from the assignments to GSO FSS currently operating and/or planned to be operated in the future. For the implementation of the above-mentioned Resolution the following course of actions are required.

2.2 The notifying administration of the inter-satellite assignments submitting RR Appendix 4 information/data elements shall also send a firm objective, measurable, enforceable and actionable commitment to undertake:

a) that, in case of reported unacceptable interference, it shall immediately cease the interference or reduce it to an acceptable level;

b) to this effect the Bureau shall send a reminder and requests the notifying administration of ISS assignments to comply with the requirements referred to in the commitment;

c) should the interference continue to persist 30 days after the dispatch date of the above-mentioned reminder, the Bureau shall submit the case to the subsequent meeting of the RRB for review and eventual suppression from the database of the Bureau and inform the notifying administration accordingly.

2.3 Significant additional work is required to develop a practical regulatory regime that will enable viable space-to-space operations (between both GSO and non-GSO service provider space stations and associated user non-GSO space stations) while at the same time ensuring that the space-to-space operation shall not cause unacceptable interference to other space services and nor claim protection from FSS.

2.4 Currently there is no coordination procedure to protect other services, in particular FSS, from inter-satellite link, composed of GSO and non-GSO links. See the Rules of Procedure in this regard.

2.5 This Administration supports satellite-to-satellite transmissions “within the cone of coverage” concept of operations.

2.6 With respect to the studies carried out under this agenda item, as contained in the CPM Report to WRC‑23, this Administration supports the exclusion of 11.7‑12.2 GHz in Region 3 for this agenda item.

2.7 The technical conditions and regulatory provisions developed under WRC‑23 agenda item 1.17 shall ensure not causing unacceptable interference and nor claim protection from the terrestrial services operating in the frequency band 27.5-29.5 GHz.

2.8 The notifying administration of satellite-to-satellite transmissions when submitting RR Appendix 4 data elements to the Bureau shall also send a firm commitment undertaking that, in case of any interference to FSS or terrestrial services, it shall immediately cease emission or reduce it to the acceptable level to the interfered assignments.

The following draft Resolution may only be considered if:

a) The consideration of the frequency band 11.7-12 GHz is deleted from actions that may be taken in regard with pursuing Method B.

b) That the use of a non-GSO space station, subject to this Resolution, communicating with a GSO or non-GSO FSS space station within the frequency band 27.5-30 GHz or parts thereof is conditioned that it shall not cause unacceptable interference to nor claiming protection from GSO FSS.

c) The above conditions shall be included in an objective, measurable and enforceable firm commitment with actionable evidence submitted by the notifying administration of non-GSO space station subject to this Resolution.

ADD IRN/148A17/1#1901

draft new RESOLUTION [A117-B] (WRC‑23)

Use of the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz for satellite-to-satellite transmissions

The World Radiocommunication Conference (Dubai, 2023),

considering

*a)* that there is a need for non-geostationary-satellite orbit (non-GSO) space stations to be able to relay data to the Earth, and that part of this need could be met by allowing such non-GSO space stations to communicate with [*Alternative FSS*: fixed-satellite service (FSS)][*Alternative ISS*: inter-satellite service (ISS)] space stations operating in the geostationary-satellite orbit (GSO) and in the non-GSO in the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, or parts thereof;

*b)* that the administration responsible for the notification of non-GSO space stations communicating with GSO or non-GSO space stations in the [*Alternative FSS*: FSS][*Alternative ISS*: ISS] at higher altitude does not need to be the same administration that has already notified assignments in the [*Alternative FSS*: FSS][*Alternative ISS*: ISS];

*c)* that imposing the hard limits necessary to protect other services would provide regulatory certainty for both notifying administrations of non-GSO space stations communicating with [*Alternative FSS*: FSS][*Alternative ISS*: ISS] space stations and potentially impacted services;

*d)* that there is growing interest for utilizing satellite-to-satellite links for a variety of applications;

*e)* that the ITU Radiocommunication Sector (ITU‑R) has carried out sharing and compatibility studies between incumbent services in the frequency bands 18.1-18.6 GHz, 18.8-20.2 and 27.5-30 GHz and adjacent bands and satellite-to-satellite transmissions in the [*Alternative FSS*: FSS][*Alternative ISS*: ISS];

*f)* that these studies were based on certain principles, including the limitation of the use of frequency bands in a specific direction in accordance with the existing FSS allocations in these frequency bands, the use of power control and antenna-steering capabilities and compliance with applicable epfd and off-axis e.i.r.p. limits to protect incumbent services;

*g)* that the frequency bands 18.1-18.6 GHz (space-to-Earth), 18.8-20.2 GHz (space-to-Earth) and 27.5-30 GHz (Earth-to-space) are also allocated to terrestrial and space services used by a variety of different systems, and these existing services and their future development need to be protected, without the imposition of undue constraints, from the operation of satellite-to-satellite links,

recognizing

*a)* that any course of action taken under this Resolution with respect to satellite-to-satellite links has no impact on the coordination requirements with other services which are otherwise subject to coordination, regardless of date of receipt;

*b)* that any course of action taken under this Resolution has no impact on the original date of receipt of the frequency assignments of the GSO FSS satellite network or the non-GSO FSS system with which non-GSO space stations communicate or on the coordination requirements of that satellite network;

*c)* that the necessary elements consisting of interference management mechanisms and the function of the network control and monitoring centre (NCMC) and their relations with each other and sequence of actions together with estimated time for that action/function are needed for the proper and factual operation of the non-GSO subject to this agenda item;

*d)* that the full protection of the FSS in the ka band subject to this agenda item is a fundamental and important issue due to the fact that that band is used for FSS infrastructure of telecommunication/ICT of many countries, in particular, the developing countries,

resolves

1 that, for a non-GSO space station subject to this Resolution communicating with a GSO or non-GSO FSS space station within the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, or parts thereof, the following conditions shall apply:

1.1 the non-GSO space station transmitting in the frequency band 27.5-30 GHz and receiving in the frequency bands 18.1-18.6 GHz and 18.8-20.2 GHz, or parts thereof, shall only operate space-to-space links when its apogee altitude is lower than the minimum operational altitude of the GSO or non-GSO FSS space station it communicates with and when the off-nadir angle between this GSO or non-GSO FSS space station and the non-GSO space station it communicates with is less than or equal to θ*Max* (as defined in Annex 1 to this Resolution);

1.2 the GSO/non-GSO FSS space station receiving in the frequency band 27.5-30 GHz and transmitting in the frequency bands 18.1-18.6 GHz and 18.8-20.2 GHz, or parts thereof, shall only operate space-to-space links when its minimum operational altitude is higher than the apogee altitude of the non-GSO space station with which it communicates;

1.3 that the use of space-to-space links by GSO or non-GSO space stations transmitting in the frequency bands 18.1-18.6 GHz and 18.8-20.2 GHz and receiving in the frequency band 27.5-30 GHz is limited to those with recorded assignments in the relevant FSS (space-to-Earth) and (Earth-to-space) allocations in these bands;

2 that for a non-GSO space station transmitting in the space-to-space direction in the frequency band 27.5-30 GHz, the following conditions shall apply:

2.1 this non-GSO space station shall only transmit when within the cone whose apex is the GSO or non-GSO receiving space station and whose angle is θ*Max* (as defined in Annex 1 to this Resolution);

2.2 the emissions of this non-GSO space station shall remain within the envelope of the notified/recorded characteristics of the associated transmitting FSS earth stations of the GSO FSS network or non-GSO FSS system;

2.3 (*Option 3*): this non-GSO space stationshall not cause unacceptable interference to the terrestrial services in the frequency band 27.5-29.5 GHz, and Annex 2 to this Resolution shall apply, and in the frequency band 29.5-30 GHz, with respect to the terrestrial service on the territory of administrations listed in footnote No. **5.542**, Annex 2 shall also apply;

2.3*bis* the requirement to not cause unacceptable interference to terrestrial services shall not release the notifying administration of its obligation as contained in *resolves* 2.3 above;

2.4 *(Option 2)*: this non-GSO shall not cause unacceptable interference to or otherwise impose constraints on the operation or the development of non-GSO FSS systems, and protect non-GSO FSS space stations by complying with the provisions contained in Annex 4 to this Resolution;

2.5 *Option 3*: the emissions of this non-GSO space station shall not produce a power flux-density at any point in the GSO arc greater than the power flux-density produced by earth stations associated with the satellite network/system with which they communicate as determined in Annex 5 to this Resolution;

3 that for a space station transmitting in the space-to-space direction in the frequency bands 18.1-18.6 GHz and 18.8-20.2 GHz or parts thereof, the following conditions shall apply:

3.1 this non-GSO or GSO space station shall only transmit when the non-GSO receiving space station is within the cone whose apex is the GSO or non-GSO transmitting space station and whose angle is θ*Max* (as defined in Annex 1 to this Resolution);

3.2 the transmissions shall remain within the envelope of the notified/recorded characteristics of transmitting GSO FSS or non-GSO FSS towards its associated FSS earth stations;

3.3 with respect to the Earth exploration-satellite service (EESS) (passive) operating in the frequency band 18.6-18.8 GHz, any non-GSO FSS system with an orbital apogee of less than 20 000 km communicating with lower orbiting non-GSO space stations in the frequency bands 18.3-18.6 GHz and 18.8-19.1 GHz and for which the complete notification information has been received by the Radiocommunication Bureau (BR) after 1 January 2025 shall comply with the provisions indicated in Annex 3 to this Resolution;

3.4 for space-to-space links in the frequency band 19.3-19.7 GHz, or parts thereof,

 *Option 2:* a GSO or non-GSO space station communicating with a non-GSO space station shall not produce a power flux-density on the surface of the Earth towards a non-GSO mobile satellite gateway station site that exceeds −148 dB(W/(m2 · MHz)). This limit may be exceeded at the site of a non-GSO mobile satellite gateway station of any country whose administration has so agreed as long as these limits are unchanged in cross-border applications;

4 that non-GSO space stations receiving in the frequency bands 18.1-18.6 GHz and 18.8-20.2 GHz, or parts thereof, shall not claim protection from FSS, mobile-satellite service (MSS) networks and systems and MetSat as well as terrestrial services operating in conformity with the Radio Regulations;

5 that space stations receiving space-to-space transmissions in the frequency band 27.5-30 GHz from non-GSO space stations shall, for these inter-satellite links, not claim protection from FSS and MSS networks and systems as well as terrestrial services operating in conformity with the Radio Regulations;

6that assignments to space-to-space links in the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz shall not cause unacceptable interference to nor claim protection from GSO FSS services operating in the frequency band allocated to the FSS;

7 that the notifying administration shall be fully responsible for appropriate and necessary action(s) relating to interference management mechanisms and the function of the NCMC and their relations with each other, and sequence of actions together with estimated time for that action/function required for the proper and factual operation of non-GSO subject to this agenda item in line with *recognizing c)* above, and the implementation of this Resolution is conditioned on the development of the description of interference management system(s), monitoring facilities (NCMC), dealing with the cessation of transmission in order to provide a satisfactory resolution of the problem;

8 for the implementation of *resolves*6, the following actions need to be pursued:

*a)* the notifying administration of the inter-satellite assignments submitting Appendix 4 information/data elements shall also send a firm objective, measurable, enforceable and actionable commitment that in case of reported unacceptable interference, it shall immediately cease the interference or reduce it to an acceptable level;

*b)* in the commitment, the notifying administration shall state that in case of no action is taken in regard with obligation referred to in section *a)* above, the Bureau shall send a reminder and request that administration to comply with the requirements referred to in the commitment;

*c)* should the interference continue to persist after the expiry of the 30 days period from the dispatch date of the above-mentioned reminder, the Bureau shall submit the case to the subsequent meeting of the RRB for review and necessary action, as appropriate,

resolves further

1 that, subject to this Resolution:

*a)* the notifying administration of the non-GSO system choosing to operate satellite-to-satellite links and receiving in the frequency bands 27.5-28.6 GHz and 29.5-30.0 GHz shall indicate to the BR the commitment that the equivalent power flux-density produced at any point in the geostationary-satellite orbit by emissions from all combined operations of space-to-space and associated earth station transmissions shall not exceed the limits given in Table **22‑2**;

*b)* the notifying administration of the non-GSO space station/stations transmitting in the frequency band 27.5-30 GHz towards a GSO network and receiving in the frequency bands 18.1-18.6 GHz and 18.8-20.2 GHz shall send to the BR the relevant Appendix **4** advance publication information containing the characteristics of the non-GSO space station/stations and the associated name of the notified GSO FSS network with which it intends to communicate;

*c)* the notifying administration of the non-GSO space station/stations transmitting in the frequency bands 27.5-29.1 GHz and 29.5-30.0 GHz towards a non-GSO system and receiving in the frequency bands 18.1-18.6 GHz and 18.8-20.2 GHz shall send to the BR the relevant Appendix **4** advance publication information containing the characteristics of the non-GSO space station/stations and the associated name of the notified non-GSO FSS system(s) with which it intends to communicate;

*d)* the notifying administration for the non-GSO space station transmitting in the space-to-space direction in the frequency band 27.5-30 GHz shall provide to the BR, when submitting Appendix **4** data, an objective, measurable and enforceable commitment that, upon receiving a report of unacceptable interference, the notifying administration will follow the procedures in *resolves further* 2;

2 that, in case of unacceptable interference caused by a non-GSO space station transmitting in the frequency band 27.5-30 GHz or parts thereof:

*a)* the notifying administration for that non-GSO space station shall cooperate with an investigation on the matter and provide, to the extent of its ability, any required information on the operation of the transmitting space station and a point of contact to provide such information;

*b)* the notifying administration for that non-GSO space station and the notifying administration of the GSO or non-GSO space station receiving these space-to-space transmissions shall, jointly or individually, as the case may be, upon receipt of a report of unacceptable interference, take the required action to eliminate or reduce interference to an acceptable level;

*c)* in case of continued unacceptable interference despite of the firm commitment to remove that, the assignment causing interference shall be submitted to the Radio Regulations Board for review;

3 that the notifying administration for the GSO or non-GSO FSS receiving space-to-space transmissions in the frequency band 27.5-30 GHz shall ensure that:

*a)* the non-GSO space stations transmitting in these frequency bands employed techniques to maintain pointing accuracy with the associated receiving space station and avoid tracking inadvertently adjacent GSO space stations of any other notifying administration or space stations in a non-GSO system of any other notifying administration;

*b)* all necessary measures are taken so that non-GSO transmitting space stations in these frequency bands are subject to permanent monitoring and control by a network control and monitoring centre (NCMC) or equivalent facility and are capable of receiving and acting upon at least “enable transmission” and “disable transmission” commands from the NCMC or equivalent facility;

*c)* a permanent point of contact is provided for the purpose of tracing any cases of unacceptable interference from non-GSO transmitting space stations in these frequency bands in the [*Alternative FSS:* FSS (space-to-space)][*Alternative ISS*: ISS] service and to immediately respond to requests from the focal point;

4 that, upon examination of the information submitted by the notifying administration under *resolves further*1*b)* or 1*c)*, if no recorded frequency assignments with typical earth stations for the relevant frequency bands can be identified for the GSO FSS network or non-GSO FSS system with which the notifying administration’s non-GSO space station intends to communicate, the BR shall return the information to the notifying administration with an unfavourable finding,

instructs the Director of the Radiocommunication Bureau

1 to take all necessary actions to facilitate the implementation of this Resolution, together with providing any assistance for the resolution of interference, if and when required;

2 to report to future world radiocommunication conferences any difficulties or inconsistencies encountered in the implementation of this Resolution;

3 to use the methodology given in the Appendix to Annex 2 of this Resolution when assessing compliance with the pfd limits in Annex 2;

4 to use the methodology given in Appendices 1 to 3 to Annex 5 of this Resolution when assessing compliance with Annex 5.

SUP IRN/148A17/2#1890

RESOLUTION 773 (WRC-19)

Study of technical and operational issues and regulatory provisions for
satellite-to-satellite links in the frequency bands 11.7-12.7 GHz,
18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz

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