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| **World Radiocommunication Conference (WRC-19) Sharm el-Sheikh, Egypt, 28 October – 22 November 2019** |  |
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| PLENARY MEETING | **Addendum 24 to Document 54-E** |
|  | **7 October 2019** |
|  | **Original: English** |
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| Samoa (Independent State of)/Singapore (Republic of) | |
| Proposals for the work of the conference | |
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| Agenda item 10 | |

10 to recommend to the Council items for inclusion in the agenda for the next WRC, and to give its views on the preliminary agenda for the subsequent conference and on possible agenda items for future conferences, in accordance with Article 7 of the Convention.

Proposal to consider the results of studies on the compatibility of satellite-to-satellite links, in the Earth-to-space direction in the 27.5 – 30 GHz, and space-to-Earth in frequency bands 17.7-18.6 GHz, 18.8-20.2 GHz with other FSS operations and other services

Background

No **1.21** of the Radio Regulations defines fixed-satellite service (FSS) as follows:

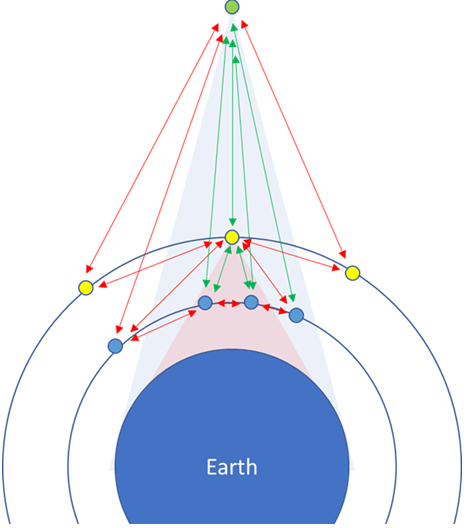
“A radiocommunication service between earth stations at given positions, when one or more satellites are used; the given position may be a specified fixed point or any fixed point within specified areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service; the fixed-satellite service may also include feeder links for other space radiocommunication services.”

The “some cases” in which satellite-to-satellite links are included in the FSS are not elaborated in either the Radio Regulations or associated ITU publications. Nevertheless, the possibility for satellite-to-satellite links within the FSS exists.

As reported by the Director of the Radiocommunication Bureau to the final CPM for WRC-19, since 2014, there have been 27 submissions of advance publication information for non-GSO satellite systems under No. **4.4** of the Radio Regulations specifying use by a non-allocated space service of frequency bands allocated to another space service. See Document CPM19-2/17, at Section 3.1.3.2 (preliminary draft Report of the Director to WRC-19 on Activities of the Radiocommunication Sector)[[1]](#footnote-1)\*. Notification information was subsequently filed for frequency assignments to 3 of these systems. The Director’s draft Report states that “[n]one of these frequency assignments was reported to the BR as causing harmful interference to any service of another administration.” Document CPM19-2/17, at Section 3.1.3.2\*.

The challenge comes, as the Director of the Radiocommunication Bureau has acknowledged, in finding a path to recognition in the Radio Regulations for such uses, where possible, based on the technical conditions derived from ITU-R studies. Because frequency bands allocated to the fixed-satellite service are used for links between space stations and earth stations, it is necessary to analyse the use of the same bands for satellite-to-satellite links to ensure compatibility and avoid harmful interference. The sharing scenario is likely to differ as the orbital characteristics of the linked satellites vary.

The proposed satellite to satellite links should follow the directional designations as allocated in Article **5** to the ITU Radio Regulations for the proposed FSS frequency bands of 27.5-30 GHz (Earth-to-space direction) and 17.7-18.6 GHz, 18.8-20.2 GHz (space-to-Earth direction). In addition, the satellite to satellite link shall only be permitted, as expressed with the green arrows in the figure below, when satellites are within the cone defined by the serving satellite at the apex of the cone and that satellite’s zero degree elevation contour intersecting with the Earth. For avoidance of doubt, the links expressed with red arrows in the figure below are not within the scope of this proposal.



Preliminary ITU-R studies have identified factors to be considered in assessing the compatibility of non-GSO satellite-to-GSO satellite links, in the Earth-to-space direction in the 27.5-30 GHz frequency band and space-to-Earth in frequency bands 17.7-18.6 GHz, 18.8-20.2 GHz, with other FSS operations and other services. Continued development and completion of these studies to include non-GSO satellite-to-satellite links will permit the development of appropriate ITU-R regulatory text to define the cases in which such transmissions may be provided, and allow for a determination of whether the recognition of compatible links can be made via appropriate modifications to the studied FSS allocations in Article **5**.

Proposals

Samoa and Singapore propose to study the satellite to satellite links (between non-GSO to non-GSO systems and between non-GSO to GSO systems) under FSS to develop the technical/regulatory measures to facilitate such services in the bands of 27.5-30 GHz (Earth-to-space direction) and 17.7-18.6 GHz, 18.8-20.2 GHz (space-to-Earth direction).

The proposal is provided using the template of Annex 2 to Resolution **804 (Rev.WRC-12)**.

ADD SMO/SNG/54A24/1

Draft New Resolution [SMO/SNG/A10/FSS-SAT-TO-SAT] (WRC-19)

Study of technical, operational issues, and regulatory provisions for transmissions in the Earth-to-space direction in the 27.5-30 GHz and space-to-Earth direction in frequency bands 17.7-18.6 GHz and 18.8-20.2 GHz between non-geostationary satellites to other satellites in the   
fixed-satellite service frequency bands

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

considering

*a)* that the definition of fixed-satellite service (FSS) in No. **1.21** of the Radio Regulations includes the possibility, in some cases, of satellite-to-satellite links, which may also be operated in the inter-satellite service;

*b)* that there have been expressions of interest by some administrations of using the 27.5‑30 GHz FSS Earth-to-space and space-to-Earth in frequency bands 17.7-20.2 GHz for transmissions between non-geostationary orbit (non-GSO) satellites and other FSS satellites;

*c)* that frequency bands allocated to the fixed-satellite service are used for links between earth stations and space stations, and that such links may not be operated in the inter-satellite service;

*d)* that the ITU-R has begun preliminary studies on the technical and operational issues associated with the use of non-GSO satellites transmitting toward the GSO in the 27.5-30 GHz FSS frequency band, and that such studies are expected to continue in this frequency band and other frequency bands after WRC-19;

*e)* that all allocations to the fixed-satellite service include a direction indicator,

recognizing

*a)* that it is necessary to analyse the use of the FSS (Earth-to-space) in the frequency band 27.5-30 GHz and (space-to-Earth) in the frequency band 17.7-20.2 GHz between FSS non-GSO satellites and GSO satellites to ensure compatibility with all allocated services in this frequency band and avoid harmful interference;

*b)* that the sharing scenario is likely to differ as the orbital characteristics of the non-GSO satellites vary;

*c)* that the use by a non-allocated space service of frequency bands allocated to another space service under No. **4.4** of the Radio Regulations, without recognition and on a non-harmful interference/non-protected basis, is being made today,

recognizing further

*a)* that the use of the frequency bands 27.5-28.6 GHz and 29.5-30 GHz by non-geostationary fixed-satellite service systems is subject to the application of the provisions of Nos. **5.484A**, **22.5C** and **22.5I**;

*b)* that use of the frequency band 28.6-29.1 GHz by geostationary and non-geostationary fixed-satellite service networks is subject to the application of the provisions of No. **9.11A**, and No. **22.2** does not apply (No. **5.523A**);

*c)* that use of the frequency band 29.1-29.5 GHz (Earth-to-space) by the fixed-satellite service is limited to geostationary-satellite systems and feeder links to non-geostationary satellite systems in the mobile-satellite service, and that such use is subject to the application of the provisions of No. **9.11A**, but not subject to the provisions of No. **22.2**, except as indicated in Nos. **5.523C** and **5.523E**, where such use is not subject to the provisions of No. **9.11A** and shall continue to be subject to Articles **9** (except No. **9.11A**) and **11** procedures, and to the provisions of No. **22.2** (No. **5.535A**);

*d)* that the frequency band 27.5-30 GHz may be used by the fixed-satellite service (Earth-to-space) for the provision of feeder links for the broadcasting-satellite service (No. **5.539**);

*e)* that feeder links of non-geostationary networks in the mobile-satellite service and geostationary networks in the fixed-satellite service operating in the frequency band 29.1-29.5 GHz (Earth-to-space) shall employ uplink adaptive power control or other methods of fade compensation, such that the earth station transmissions shall be conducted at the power level required to meet the desired link performance while reducing the level of mutual interference between both networks (No. **5.541A**);

*f)* that the fixed and mobile services are allocated on a primary basis in the frequency bands 17.7-17.8 GHz, 18.1-19.7 GHz and 27.5-29.5 GHz frequency bands on a global basis and fixed service is also primary within 17.8-18.1GHz;

*g)* that the frequency band 28.5-29.5 GHz (Earth-to-space) is also allocated to the Earth exploration-satellite service on a secondary basis, and no additional constraints should be imposed on the EESS and the conditions of fixed-satellite service operation are described in Resolution **750** **(Rev. WRC-15)**;

*h)* that the frequency band 29.5-30 GHz (Earth-to-space) is also allocated to the mobile-satellite service on a primary basis in 29.5-30 GHz in Region 2, on a primary basis in 29.9-30 GHz in Regions 1 and 3, and on a secondary basis in Regions 1 and 3 in 29.5-29.9 GHz;

*i)* that parts of the frequency band 17.7-18.1 GHz are used by feeder links for the broadcasting-satellite service, subject to Appendix **30A** (No. **5.516**);

*j)* that use of the frequency band 18.1-18.4 GHz by the fixed-satellite service (Earth-to-space) is limited to feeder links of geostationary-satellite systems in the broadcasting-satellite service (No. **5.520**);

*k)* that the frequency band 18.6-18.8 GHz is used by the Earth exploration-satellite service (EESS) (passive) in remote sensing by Earth exploration and meteorological satellites, and protection from interference is essential for passive sensing measurements and applications, especially for measurements of known spectral lines, which are of particular importance;

*l)* that all allocated services in these frequency bands should be taken into account,

noting

*a)* that preliminary ITU-R studies have identified factors to be considered in assessing the compatibility of non-geostationary satellite to-geostationary FSS satellite links in the Earth-to-space direction with existing services in the 27.5-30 GHz frequency band;

*b)* that further development of these studies, may identify and define the cases in which transmissions in the Earth-to-space direction from non-GSO satellites in the 27.5-30 GHz and space-to-Earth in frequency bands 17.7-20.2 GHz to other FSS satellites can be made without causing unacceptable or harmful interference to existing services,

resolves to invite ITU-R

1 to study the technical and operational characteristics and user requirements of different types of non-GSO space stations that plan transmissions in the general Earth-to-space direction in the frequency band 27.5-30 GHz and space-to-Earth in frequency bands 17.7-18.6 GHz and 18.8‑20.2 GHz to GSO and non-GSO FSS space stations;

2 to study sharing and compatibility between non-GSO space stations transmitting in the general Earth-to-space direction in the 27.5-30 GHz frequency bands and space-to-Earth in frequency bands 17.7-18.6 GHz and 18.8 - 20.2 GHz to GSO and non-GSO FSS space stations and current and planned stations of the FSS and other existing services allocated in same frequency bands, to ensure protection of, and not impose undue constraints on, other FSS operations and other services allocated in those frequency bands and taking into account *recognizing further* *a)* to *l)*;

3 to develop, for different types of non-GSO space stations and different portions of the frequency bands studied, technical conditions and regulatory provisions for their operation, including new or revised allocations as appropriate, taking into account the results of the studies above;

4 to complete these studies by the 2023 World Radiocommunication Conference,

invites the 2023 World Radiocommunication Conference

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

invites administrations

to participate in the studies and to provide input contributions.

**Reasons:** To supplement the inclusion of this new agenda item for WRC-23.

ANNEX

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| **Subject:**  Proposed future WRC agenda item for WRC-2023 to consider the results of studies on the compatibility of satellite-to-satellite links, in the Earth-to-space direction in the 27.5-30 GHz, and space-to-Earth in frequency bands 17.7-18.6 GHz, 18.8-20.2 GHz with other FSS operations and other services | |
| **Origin:** Samoa andSingapore | |
| ***Proposal*:**  To identify the cases and conditions under which transmissions in the Earth-to-space direction in the 27.5-30 GHz and space-to-Earth in frequency bands 17.7-18.6 GHz, 18.8-20.2 GHz from non-geostationary orbit space stations to geostationary-orbit or non-geostationary orbit space stations may be accommodated on a basis other than under No. **4.4** of the Radio Regulations, taking into account the necessary protection of existing services, in accordance with Resolution **[SMO/SNG/A10/FSS-SAT-TO-SAT]** (WRC-19).  To provide a means for recognizing in the Radio Regulations transmissions in the Earth-to-space direction in the 27.5-30 GHz and space-to-Earth in frequency bands 17.7-18.6 GHz, 18.8-20.2 GHz from non-GSO to other space stations where conditions of avoiding interference with existing systems are met. | |
| ***Background/Reason:***  As reported by the Director of the Radiocommunication Bureau to the final CPM for WRC-19, since 2014, there have been 27 submissions of advance publication information for non-GSO satellite systems under No. **4.4** of the Radio Regulations specifying use by a non-allocated space service of frequency bands allocated to another space service. SeeDocument CPM19‑2/017, at Section 3.1.3.2 (Preliminary Draft Report of the Director to WRC-19 on Activities of the Radiocommunication Sector)\*. Notification information was subsequently filed for frequency assignments to 3 of these systems. The Director’s draft report states that “[n]one of these frequency assignments was reported to the BR as causing harmful interference to any service of another administration.” Document CPM19-2/017, at Section 3.1.3.2.  The challenge comes, as the Director of the Radiocommunication Bureau has acknowledged, in finding a path to recognition in the Radio Regulations for such uses, where possible, based on the technical conditions derived from ITU-R studies. Because frequency bands allocated to the fixed-satellite service are used for links between space stations and earth stations, it is necessary to analyse the use of the same bands for satellite-to-satellite links to ensure compatibility and avoid harmful interference. The sharing scenario is likely to differ as the orbital characteristics of the linked satellites vary.  The proposed satellite to satellite links should follow the directional designations as allocated in Article **5** to the ITU Radio Regulations for the proposed FSS frequency bands of 27.5‑30 GHz (Earth-to-space direction) and 17.7-18.6 GHz, 18.8-20.2 GHz (space-to-Earth direction). In addition, the satellite to satellite link shall only be permitted, as expressed with the green arrows in the figure below, when satellites are within the cone defined by the serving satellite at the apex of the cone and that satellite’s zero degree elevation contour intersecting with the Earth. For avoidance of doubt, the links expressed with red arrows in the figure below are not within the scope of this proposal.    Preliminary ITU-R studies have identified factors to be considered in assessing the compatibility of non-GSO satellite-to-GSO satellite links, in the Earth-to-space direction in the 27.5-30 GHz frequency band and space-to-Earth in frequency bands 17.7-18.6 GHz, 18.8‑20.2 GHz, with other FSS operations and other services. Continued development and completion of these studies to include non-GSO satellite-to-satellite links will permit the development of appropriate ITU-R regulatory text to define the cases in which such transmissions may be provided, and allow for a determination of whether the recognition of compatible links can be made via appropriate modifications to the studied FSS allocations in Article **5**. | |
| ***Radiocommunication services concerned*:**  Broadcasting-satellite, Earth exploration-satellite, fixed, fixed-satellite, mobile, mobile-satellite | |
| ***Indication of possible difficulties*:**  None foreseen | |
| ***Previous/ongoing studies on the issue*:**  Studies have been initiated in Working Party 4A during the 2016-2019 ITU-R Study Cycle. | |
| ***Studies to be carried out by*:**  ITU-R Study Group 4 | ***with the participation of*:**  Administrations, ITU-R members |
| ***ITU‑R Study Groups concerned*:**  SG-5 and SG-7 | |
| ***ITU resource implications, including financial implications (refer to CV126)*:**  This proposed agenda item will be studied as part of the regular ITU-R procedures and planned budget. | |
| ***Common regional proposal*:** No | ***Multicountry proposal*:** Yes  ***Number of countries*:** |
| ***Remarks*** | |

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1. \* Note by the Secretariat: same section 3.1.3.2 in WRC-19 Document 4(Add.2). [↑](#footnote-ref-1)