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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. 5906/23****06 August 2023****Original: English** |
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|  | **PROPOSALS FOR THE WORK OF THE CONFERENCE AGENDA ITEM 10 – PAI 2.8 MSS SPACE-TO-SPACE LINKS** |  |
|  | **(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:** |
| Under agenda item 10, the United States of America supports the inclusion of preliminary agenda item 2.8 on the WRC-27 agenda with the modifications provided. |

**UNITED STATES OF AMERICA**

**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)*

**BACKGROUND INFORMATION:**

Space station operations in low-Earth orbit are experiencing significant growth for scientific, academic, and commercial purposes. These operations encompass a range of sizes, from the International Space Station to single unit cubesats, and encompass diverse data requirements. However, they all share a common need to transmit data to Earth efficiently and cost-effectively.

Telecommunications satellites offer a ready means to fulfill this need. The possibility for satellite-to-satellite links could address a need to relay data to a desired earth station where the satellite-to-satellite link is being transmitted in the same general direction (e.g., Earth-to-space or space-to-Earth) within the receive or transmit beam of the higher orbital altitude space station. Sharing studies completed by ITU-R WP4A have demonstrated compatibility with existing services and have identified the technical and operational provisions needed to ensure protection of existing services.

WRC-19 recognized that mobile-satellite service (MSS) systems could also play an important role in fulfilling some of the lower data rate needs of low-Earth orbiting space stations in relaying data to the ground and included agenda item 2.8 on the preliminary agenda for WRC-27.

**PROPOSAL:**

The frequency bands referenced in this proposal are allocated to the MSS, and are used for links between space stations and mobile earth stations. However, in order to utilize these same bands for satellite-to-satellite links, careful analysis is required to ensure compatibility with all existing services. In addition, the sharing scenario is likely to differ as the orbital characteristics of the linked satellites vary. The United States of America supports the inclusion of agenda item 2.8 on the WRC-27 agenda with the modifications provided.

**Proposals:**

**ADD USA/1**

Draft New Resolution [USA-2027]

**Agenda for the 2027 World Radiocommunication Conference**

The World Radiocommunication Conference (TBD United Arab Emirates, 2023),

*considering*

*a)* that, in accordance with No. 118 of the ITU Convention, the general scope of the agenda for WRC‑27 should be established four to six years in advance;

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

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

*resolves to give the view*

that the following items should be included in the preliminary agenda for WRC‑27:

1 to take appropriate action in respect of those urgent issues that were specifically requested by WRC‑23;

2 on the basis of proposals from administrations and the Report of the Conference Preparatory Meeting, and taking account of the results of WRC‑23, to consider and take appropriate action in respect of the following items:

[…]

2.8 to study the technical and operational matters, and regulatory provisions, for space-to-space links in the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5‑1 660.5 MHz and 2 483.5-2 500 MHz among non-geostationary and geostationary satellites operating in the mobile-satellite service, in accordance with Resolution **249** **(Rev 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 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 10.2 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 add an agenda item for the study of satellite-to-satellite links in certain frequency bands allocated to the mobile-satellite service.

**MOD USA/2**

RESOLUTION 249 (Rev. WRC‑23)

**Study of technical and operational issues and regulatory provisions for use of the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz 1 610-1 645.5 and 1 646.5-1 660.5 MHz and 2 483.5-2 500 MHz for space-to-space transmissions**

The World Radiocommunication Conference (Dubai , 2023),

*considering*

*a)* that the definition of mobile-satellite service (MSS) in No. **1.25** includes communication between space stations;

*b)* that the definition of inter-satellite service (ISS) in No. **1.22** includes only links between space stations, and that the term *inter-satellite link* in this resolution is taken to mean a radiocommunication service link between artificial satellites;

*c)* that many non-geostationary-satellite orbit (non-GSO) satellites operate with limited and non-real-time connectivity to earth stations;

*d)* that by utilizing space-to-space communication between such non-GSO satellites and MSS satellites operating at higher orbital altitudes to relay data to/from the ground, data can be made available in near-real time enhancing the availability and value of instrument data for low latency applications;

*e)* that MSS satellites operating in the frequency bands 1 525‑1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660.5 MHz and 2 483.5-2 500 MHz can could support these types of operation;

*h)* that MSS allocations in the above frequency bands include a space-to-Earth or Earth-to-space direction indicator, but do not include a space-to-space direction indicator;*i)* that the ITU Radiocommunication Sector (ITU‑R) has begun preliminary studies on the technical and operational issues associated with the operation of space-to-space links between non-GSO MSS satellites and GSO MSS satellites in the above frequency bands, but no studies have been conducted on the technical and operational issues associated with the operation of space-to-space links between non-GSO MSS satellites and non-GSO MSS satellites in the above frequency bands to determine whether space-to-space operations are compatible;

*j)* that it is technically feasible for a lower orbital altitude non-GSO space station to transmit data to and receive data from a higher orbital altitude non-GSO or GSO space station when passing within the satellite antenna coverage beam that is directed towards the Earth;

*k)* that several satellite systems operate satellite-to-satellite transmissions in existing satellite frequency bands under No. **4.4**;

*l)* that there is growing interest for using space-to-space satellite links for a variety of applications;

*m)* that a precedent for space-to-space links sharing with Earth-to-space links or space-to-Earth links exists for the space operation, Earth exploration-satellite and space research services in other frequency bands through the inclusion of a space-to-space direction indicator,

*recognizing*

*a)* that it is necessary to study the impact on, and to protect, other services, as well as Earth-to-space and space-to-Earth operation within the MSS, of the operation of inter-satellite links in the above frequency bands, taking into account applicable footnotes to the Table of Frequency Allocations, to ensure compatibility with all primary allocated services in these frequency bands and the adjacent frequency bands and avoid harmful interference;

*b)* that there should be no additional regulatory or technical constraints imposed on primary services to which the frequency bands and adjacent frequency bands are currently allocated;

*c)* that it is necessary to study whether space-to-Earth direction transmissions from space stations at higher orbital altitudes, including GSO, can be successfully received by lower orbital altitude non-GSO satellites, without imposing any additional constraints on all allocated services in these frequency bands;

*d)* that the sharing scenarios may vary widely because of the wide variety of orbital characteristics of the non-GSO MSS space stations;

*e)* that out-of-band emissions, signals due to antenna pattern sidelobes, and in-band unintentional radiation due to Doppler shifts may impact services operating in the same and adjacent or nearby frequency bands;*f)* that currently the only option for MSS space stations in the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646-1 660.5 MHz and 2 483.5-2 500 MHz needing to communicate with other orbital space stations is to operate under No. **4.4**, without recognition and on a non-harmful interference/non-protected basis in frequency bands allocated to primary space service;

*g)* that RR No. 5.356 states that the use of the band 1 544-1 545 MHz by the mobile-satellite service (space-to-Earth) is limited to distress and safety communications (see Article 31);

*h)* that RR Nos. **5.357A** and **5.362A** provide priority for accommodating the spectrum requirements of the aeronautical mobile-satellite (R) service in the frequency bands 1545-1555, 1610-1626.5 MHz, and 1646.5-1656.5 MHz, and 1555-1559 and 1656.5-1660.5 MHz, respectively,

*recognizing further*

*a)* that the use of frequency bands by the MSS in the frequency range 1-3 GHz is subject to existing Resolutions, coordination requirements and country footnotes taking into account, in particular, the protection of safety services and aeronautical mobile-satellite (R) services, and of the Global Maritime Distress and Safety System;

*b)* that the fixed and mobile services are allocated on a primary basis in the frequency band 2 483.5-2 500 MHz on a global basis and that the fixed service is also allocated on a primary basis in the frequency band 1 525-1 530 MHz in Regions 1 and 3;

*c)* that the radionavigation-satellite service is allocated on a primary basis in the frequency band 1 559-1 610 MHz for both space-to-Earth and space-to-space use;

*d)* that the radio astronomy service is susceptible to interference from space and airborne transmitters (see Article **29**), and the location on space stations of transmitters operating in both the space-to-Earth and the Earth-to-space direction for the purpose of enacting inter-satellite links presents a new operating scenario,

*noting*

*a)* that section 3.1.3.2 of the Director’s Report to WRC-23 highlighted that the Radiocommunication Bureau has received an increased number of Advance Publication Information (API) submissions for non-GSO networks in frequency bands which are not allocated by Article **5** for the type of service foreseen, including satellite network filings for inter-satellite applications in frequency bands allocated only in the Earth-to-space or space-to-Earth directions;

*b)* that the Director’s Report concluded that, in view of recent technical developments and the increasing number of submissions of inter-satellite links in frequency bands not allocated to the ISS or to a space service in the space-to-space direction, this conference may wish to consider means to give recognition to these uses based on the conditions derived from studies by the ITU‑R in order to avoid interfering with existing systems operating in the same frequency bands,

*resolves to invite the ITU Radiocommunication Sector*

1 to study the technical and operational characteristics of different types of non-GSO MSS space stations that operate or plan to operate space-to-space links with GSO MSS networks in the following frequency bands:

a) Earth-to-space direction in the frequency bands 1 626.5-1 645 5 MHz and 1 646.5-1 660.5 MHz; and

b) space-to-Earth direction in the frequency bands 1 525-1 544 MHz and 1 545-1 559 MHz;2 to study the technical and operational characteristics, including those listed in *recognizing e)*, of non-GSO MSS space stations that operate or plan to operate space-to-space links with non-GSO MSS systems and GSO MSS networks in the following frequency bands:

a) Earth-to-space direction in the frequency band 1 610-1 626.5 MHz; and

b) space-to-Earth direction in the frequency bands 1 613.8-1 626.5 MHz and 2 483.5-2 500 MHz;

3 to study sharing and compatibility between space-to-space links in the cases described in *resolves to invite the ITU Radiocommunication Sector* 1 and 2 and

– current and planned stations of the MSS;

– other existing primary services allocated in the same frequency bands taking into account, in particular, recognizing *h*;

– other existing primary services allocated in adjacent frequency bands where those services are not also allocated in the aforementioned frequency bands; and

– existing passive services and safety services allocated in adjacent frequency bands,

in order to ensure protection of, and not impose undue constraints on, other MSS operations and other services allocated in those frequency bands and in adjacent frequency bands, taking into account *recognizing further* *a)* to *d)*;

4 to develop technical conditions and regulatory provisions for the operation of space-to-space links in these frequency bands, including new or revised MSS allocations or the addition of ISS allocations on a primary or secondary basis while ensuring the protection of, and without imposing additional constraints on, other MSS operations or services allocated in those and adjacent frequency bands, taking into account the results of the studies called for in *resolves to invite the ITU Radiocommunication Sector*1, 2,and 3above;

5 to complete these studies by WRC-27,

*invites administrations*

to participate in the studies by submitting contributions to ITU‑R,

*invites the 2027 World Radiocommunication Conference*

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