

RESOLUTION 249 (WRC-19)

Study of technical and operational issues and regulatory provisions for space-to-space transmissions in the Earth-to-space direction in the frequency bands [1 610-1 645.5 and 1 646.5-1 660.5 MHz] and the space-to-Earth direction in the frequency bands [1 525-1 544 MHz], [1 545-1 559 MHz], [1 613.8-1 626.5 MHz] and [2 483.5-2 500 MHz] among non-geostationary and geostationary satellites operating in the mobile-satellite service*

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

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 space-to-space communication between such non-GSO satellites and geostationary-satellite orbit (GSO) MSS satellites would enhance the security and efficiency of operations;
- 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 support these types of operation;
- f)* that using the frequency bands 1 610-1 645.5 MHz and 1 646.5-1 660.5 MHz allocated to the MSS (Earth-to-space) for transmissions in the Earth-to-space direction from non-GSO MSS space stations towards MSS space stations operating at higher orbital altitudes, including GSO, may increase spectral efficiency in these frequency bands;
- g)* that using the frequency bands 1 525-1 544 MHz, 1 545-1 559 MHz, 1 613.8-1 626.5 MHz and 2 483.5-2 500 MHz allocated to the MSS (space-to-Earth) for transmissions in the space-to-Earth direction from MSS space stations operating at higher orbital altitudes, including GSO, towards non-GSO MSS satellites, may increase spectral efficiency in these frequency bands;
- h)* that all 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;

* The appearance of square brackets around certain frequency bands in this Resolution is understood to mean that WRC-23 will consider and review the inclusion of these frequency bands with square brackets and decide, as appropriate.

RES249-2

- 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;
- 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 have been relying on satellite-to-satellite communication in existing satellite frequency bands under No. 4.4, and such reliance on No. 4.4 does not provide a sound basis for continued development of such systems nor the confidence in commercial viability and availability of the service to the end users;
- l)* that there is growing interest for utilizing space-to-space satellite links for a variety of applications;
- m)* that a precedent for space-to-space links sharing with Earth-to-space and space-to-Earth exists for the space operation, Earth exploration-satellite and space research services in the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz through the inclusion of a space-to-space allocation,

recognizing

 - a)* that it is necessary to study the impact on 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 band 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, reflections from receiving space stations 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 another space service,

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,

noting

a) that section 3.1.3.2 of the Director's Report to this conference highlights 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 concludes 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 ITU-R Working Parties 4A and 4C 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];

RES249-4

2 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 non-GSO 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 services allocated in the same frequency bands; and
- other existing 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 c);*

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 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 3 above;*

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.