RESOLUTION 249 (REV.WRC-23)

Study of technical and operational issues and regulatory provisions for space-to-space transmissions in the frequency bands 1 518-1 544 MHz, 1 545-1 559 MHz, 1 610-1 645.5 MHz, 1 646.5-1 660 MHz, 1 670-1 675 MHz and 2 483.5-2 500 MHz

The World Radiocommunication Conference (Dubai, 2023),

considering

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

b) that, by utilizing space-to-space communication between such non-GSO satellites and mobile-satellite service (MSS) satellites operating at higher orbital altitudes, including in the geostationary-satellite orbit (GSO), to relay data to or from the ground, data can be made available in near-real time, enhancing the availability and value of instrument data for low latency applications;

c) that all MSS allocations in the frequency bands 1 518.0-1 544.0 MHz, 1 545.0-1 559.0 MHz, 1 610.0-1 645.5 MHz, 1 646.5-1 660.0 MHz, 1 670.0-1 675.0 MHz and 2 483.5-2 500.0 MHz include a space-to-Earth or Earth-to-space direction indicator but do not include a space-to-space direction indicator;

d) 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 some of 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;

e) 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;

f) that several satellite systems operate space-to-space transmissions in some of the above frequency bands under No. **4.4**, without defined regulatory protection mechanisms, subject to the application of No. **8.5**;

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

h) that a precedent for space-to-space links sharing with Earth-to-space links or space-to-Earth links exists for other space services, for example, 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 direction indicator,

recognizing

a) that it is necessary to study the impact on, and to protect, other services, including Earth-to-space and space-to-Earth operation within the MSS, from the operation of space-to-space 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,

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 (GMDSS);

b) that the fixed and mobile services are allocated on a primary basis in the frequency bands 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 No. **5.356** states that the use of the frequency band 1 544-1 545 MHz by the MSS (space-to-Earth) is limited to distress and safety communications (see Article **31**);

e) that Nos. **5.357A** and **5.362A** provide priority for accommodating the spectrum requirements of the aeronautical mobile-satellite (R) service in the frequency bands 1 545-1 555 MHz and 1 646.5-1 656.5 MHz, and 1 555-1 559 MHz and 1 656.5-1 660.5 MHz, respectively;

f) that No. **5.353A** provides priority for distress, urgency and safety communications of the GMDSS in the frequency bands 1 530-1 544 MHz and 1 626.5-1 645.5 MHz;

g) that the radio astronomy service is allocated on a primary basis in the frequency bands 1 610.6-1 613.8 MHz and 1 660-1 670 MHz, and No. **5.149** applies;

h) that according to No. **5.366** the frequency band 1 610-1 626.5 MHz is reserved on a worldwide basis for the use and development of airborne electronic aids to air navigation and any directly associated ground-based or satellite-borne facilities, and such satellite use is subject to agreement obtained under No. **9.21**;

i) that, according to No. **5.368**, the provisions of No. **4.10** do not apply with respect to the radiodetermination-satellite and mobile-satellite services in the frequency band 1 610-1 626.5 MHz; however, No. **4.10** applies in the frequency band 1 610-1 626.5 MHz with respect to the aeronautical radionavigation-satellite service when operating in accordance with No. **5.366**, the aeronautical mobile satellite (R) service when operating in accordance with No. **5.367**, and in the frequency band 1 621.35-1 626.5 MHz with respect to the maritime mobile-satellite service when used for GMDSS;

j) that according to No. **5.343** in Region 2, the frequency band 1 435-1 525 MHz is used by the aeronautical mobile service for telemetry;

k) that, in the frequency band 1 518-1 525 MHz, Nos. **5.348**, **5.348A** and **5.348B** provide that the MSS shall not claim protection from the fixed service, stations in the mobile service in the territory of Japan, and aeronautical mobile telemetry stations in the mobile service in the territory of the United States;

l) that Resolution **744 (Rev.WRC-23)** applies to use of the frequency band 1 670-1 675 MHz by the mobile-satellite service;

m) that the meteorological aids and meteorological-satellite (space-to-Earth) services are allocated on a primary basis in the frequency band 1 670-1 675 MHz,

noting

that section 3.1.3.2 of the Director's Report to WRC-19 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 links in frequency bands allocated to MSS only in the Earth-to-space or space-to-Earth directions,

resolves to invite the ITU Radiocommunication Sector to complete in time for the 2027 world radiocommunication conference

1 studies of the technical and operational characteristics of different types of non-GSO space stations that operate or plan to operate space-to-space links with GSO networks in the following frequency bands, with the limitation that these space-to-space links only operate in the same direction as the existing MSS allocations:

a) Earth-to-space direction in the frequency bands 1 626.5-1 645.5 MHz and 1 646.5-1 660 MHz; and

b) space-to-Earth direction in the frequency bands 1 525-1 544 MHz and 1 545-1 559 MHz;

2 studies of the technical and operational characteristics of different types of non-GSO space stations that operate or plan to operate space-to-space links with non-GSO systems or GSO networks in the following frequency bands, with the limitation that these space-to-space links only operate in the same direction as the existing MSS allocations:

a) Earth-to-space direction in the frequency bands 1 610-1 626.5 MHz and 1 670-1 675 MHz; and

b) space-to-Earth direction in the frequency bands 1 518-1 525 MHz, 1 613.8-1 626.5 MHz and 2 483.5-2 500 MHz;

3 studies of sharing and compatibility between space-to-space links in the cases described in *resolves to invite the ITU Radiocommunication Sector to complete in time for the 2027 world radiocommunication conference* 1 and 2 and

– current and planned stations of the MSS, taking into account, in particular, *recognizing further e)* and *f)*;

– other existing primary services allocated in the same frequency bands;

– other existing primary services allocated in adjacent frequency bands; and

– existing passive services allocated in adjacent frequency bands;

in order to ensure protection of other MSS operations and other services allocated in those frequency bands and in adjacent frequency bands, taking into account *recognizing further a)* to *m)*;

4 development of technical conditions and regulatory provisions for the operation of space-to-space links in these frequency bands, including MSS (space-to-space) allocations or the addition of inter-satellite service (ISS) allocations, in all or parts of the frequency bands identified in *resolves to invite the ITU Radiocommunication Sector to complete in time for the 2027 world radiocommunication conference* 1 and 2 above, with the condition that stations operating in an MSS (space-to-space) or ISS allocation shall not cause harmful interference to, or claim protection from, the MSS (space-to-Earth) or MSS (Earth-to-space), while ensuring the protection of other 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 to complete in time for the 2027 world radiocommunication conference* 1, 2, and 3 above,

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.