

**ATTACHMENT B**  
**to FCC Public Notice DA 18-1017**

**Draft Proposals formulated and approved within the National Telecommunications and Information Administration:**

**DOCUMENT WAC/061 (16.08.18)**

Mr. Tom Sullivan  
Chief, International Bureau  
Federal Communications Commission  
445 12<sup>th</sup> Street, SW  
Washington, DC 20554

Dear Mr. Sullivan:

The National Telecommunications and Information Administration (NTIA), on behalf of the Executive Branch agencies, approves the release of the enclosed proposals for the 2019 World Radiocommunication Conference (WRC-19) which address:

- 1) Agenda Item 1.16 – Radio Local Area Networks studies at 5 150-5 925 MHz;
- 2) Agenda Item 9, Issue 9.1.5 - Incorporation of Recommendations M.1638-1 & M.1849-1 in Nos. **5.447F** & **5.450A** by reference; and
- 3) Agenda Item 10 – Earth Exploration-Satellite Service allocation in the frequency range 40-50 MHz.

NTIA considered the federal agencies' input toward the development of these U.S. proposals for WRC-19. NTIA forwards this package for your consideration and review. If you have any questions, please contact Mr. Charles Glass, our WRC Coordinator, who can be reached at (202) 482-1896 or [cglass@ntia.doc.gov](mailto:cglass@ntia.doc.gov).

Sincerely,

Peter A. Tenhula  
Acting Associate Administrator  
Office of Spectrum Management

Enclosures (3)

**UNITED STATES OF AMERICA**  
**PROPOSALS FOR THE WORK OF THE CONFERENCE**

**Agenda Item 1.16:** To consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands between 5 150 MHz and 5 925 MHz, and take the appropriate regulatory actions, including additional spectrum allocations to the mobile service, in accordance with Resolution **239 (WRC-15)**.

**Background Information:** Resolution **239 (WRC-15)** calls for ITU-R to study WAS/RLAN technical characteristics and operational requirements in the 5 GHz frequency range. The resolution also calls for ITU-R to perform sharing and compatibility studies between WAS/RLAN applications and incumbent services in these frequency bands:

- 5 150-5 350 MHz
- 5 350-5 470 MHz
- 5 725-5 850 MHz
- 5 850-5 925 MHz

The studies are to be performed to: 1) ensure the protection of incumbent services, including their current and planned use; 2) consider enabling outdoor WAS/RLAN operations in the band 5 150-5 350 MHz; 3) potentially add mobile service allocations to accommodate WAS/RLAN operations in the 5 350-5 470 MHz and 5 725-5 850 MHz bands; and 4) identify potential WAS/RLAN use in the 5 850-5 925 MHz band.

This document proposes NOC for the 5 250-5 350 MHz, 5 350-5 470 MHz, 5 725-5 850 MHz, and 5 850-5 925 MHz bands.

**Proposal:**

Article 5

**Frequency Allocations**

**Section IV – Table of Frequency Allocations**

(See No. 2.1)

**NOC**

**USA/1.16/1**

**5 250-5 570 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>5 250-5 255</b>	EARTH EXPLORATION-SATELLITE (active) MOBILE except aeronautical mobile 5.446A 5.447F RADIOLOCATION SPACE RESEARCH 5.447D 5.447E 5.448 5.448A	
<b>5 255-5 350</b>	EARTH EXPLORATION-SATELLITE (active) MOBILE except aeronautical mobile 5.446A 5.447F RADIOLOCATION SPACE RESEARCH (active) 5.447E 5.448 5.448A	
...		

**Reasons:** Since the adoption of Resolution **229 (Rev. WRC-12)** at WRC-03, millions of WAS/RLAN (such as Wi-Fi) devices have been deployed in the band 5 250-5 350 MHz. Studies in response to *invite c* of Resolution **229** have shown that changing the WAS/RLAN operating conditions in the band 5 250-5 350 MHz would not ensure protection of incumbent radiodetermination services and EESS (active) sensors. Furthermore, the studies confirmed that the current WAS/RLAN operating conditions in the band 5 250-5 350 MHz are sufficient for WAS/RLAN users.

**NOC****USA/1.16/2****5 250-5 570 MHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
...		
<b>5 350-5 460</b>	EARTH EXPLORATION-SATELLITE (active) 5.448B RADIOLOCATION 5.448D AERONAUTICAL RADIONAVIGATION 5.449 SPACE RESEARCH (active) 5.448C	
<b>5 460-5 470</b>	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION 5.448D RADIONAVIGATION 5.449 SPACE RESEARCH (active) 5.448B	
...		

**Reasons:** Previous ITU-R studies show that sharing between WAS/RLAN and the EESS (active) systems or between WAS/RLAN and different radar systems in the band 5 350-5 470 MHz would not be feasible unless WAS/RLAN implement additional mitigation measures. After further review of currently available mitigation measures, study results show that there are no feasible mitigation techniques to facilitate sharing between WAS/RLAN and EESS (active) or between WAS/RLAN and radar systems in the 5 350-5 470 MHz band.

**NOC****USA/1.16/3****5 570-6 700 MHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
...		
<b>5 725-5 830</b> FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur 5.150 5.451 5.453 5.455	<b>5 725-5 830</b> RADIOLOCATION Amateur 5.150 5.453 5.455	
<b>5 830-5 850</b> FIXED-SATELLITE (Earth-to-space) RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.451 5.453 5.455	<b>5 830-5 850</b> RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.453 5.455	
...		

**Reasons:** WAS/RLAN already operate in various countries throughout the world within the frequency band 5 725-5 850 MHz. In Region 2, the band 5 725-5 825 MHz is also used by WAS/RLAN.

**NOC****USA/1.16/4****5 570-6 700 MHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
...		
<b>5 850-5 925</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.150	<b>5 850-5 925</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation 5.150	<b>5 850-5 925</b> FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation 5.150
...		

**Reasons:** The mobile service is co-primary in the 5 850-5 925 MHz band. Various countries have already implemented RLAN applications under the mobile allocation in this band. Therefore, any sharing analysis carried out under this agenda item should not prejudice usages of the mobile service and should not consider imposing any additional constraints on other allocated services in the band. Since multiple applications are being considered for implementation in this band, it is premature to consider regulatory changes at this time.



**UNITED STATES OF AMERICA**  
**PROPOSALS FOR THE WORK OF THE CONFERENCE**

**Agenda Item 9.1 issue 9.1.5:** Consideration of the technical and regulatory impacts of referencing Recommendations ITU-R M.1638-1 and ITU-R M.1849-1 in Nos. **5.447F** and **5.450A** of the Radio Regulations (**WRC-15**).

**Background Information:** WRC-03 allocated the 5 150-5 350 MHz and 5 470-5 725 MHz frequency bands to the mobile service on a primary basis for the implementation of Wireless Access Systems (WAS) including Radio Local Area Networks (RLANs) subject to Resolution **229 (Rev. WRC-12)**. WRC-03 also decided that the radiolocation service, the Earth exploration-satellite service (active), the space research service (active) (No. **5.447F**), and the radiodetermination service (No. **5.450A**) shall not impose on the mobile service more stringent protection criteria, based on system characteristics and interference criteria, than those stated in Recommendations ITU-R M.1638-0 and ITU-R RS.1632-0, which are incorporated in the Radio Regulations by reference.

Since WRC-03, millions of RLAN devices have been deployed worldwide. ITU-R revised Recommendation M.1638-0 during the WRC-15 study cycle. The revised recommendation (M.1638-1) included several new radars with different system characteristics, and removed the technical characteristics and protection criteria for ground-based meteorological radars, which were placed in Recommendation ITU-R M.1849-1 instead. Several new meteorological radars were also added to Recommendation ITU-R M.1849-1 during this revision process.

This document proposes to modify Nos. **5.447F** and **5.450A** to remove the references to Recommendations ITU-R M.1638-1 and M.1849-1 while retaining the same regulatory status for the allocated services.

**Proposal:**

Article 5

**Frequency Allocations**

**Section IV – Table of Frequency Allocations**

(See No. **2.1**)

**MOD**                      **USA/9.1.5/1**

**5.447F**      In the frequency band 5 250-5 350 MHz, stations in the mobile service shall not claim protection from the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active) while the radiolocation service, the Earth exploration-satellite service (active) and the space research service (active) shall not impose more stringent technical and operational limits upon the mobile service than those in 5.446A.

**Reasons:** The proposed changes will allow the allocated services to retain the same regulatory status without referencing the subject recommendations in the footnotes of the Radio Regulations. As the responsible ITU-R group routinely updates radar characteristics based on administration proposals, this solution will ensure timely consideration of radar characteristics changes without requiring conference action to modify the footnotes that reference the recommendations.

**MOD**                      **USA/9.1.5/2**

**5.450A** In the frequency band 5 470-5 725 MHz, stations in the mobile service shall not claim protection from radiodetermination service while the radiodetermination service shall not impose more stringent technical and operational limits upon the mobile service than those in 5.446A.

**Reasons:** The proposed changes will allow the allocated services to retain the same regulatory status without referencing the subject recommendations in the footnotes of the Radio Regulations. As the responsible ITU-R group routinely updates radar characteristics based on administration proposals, this solution will ensure timely consideration of radar characteristics changes without requiring conference action to modify the footnotes that reference the recommendations.

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**UNITED STATES OF AMERICA**  
**PROPOSALS FOR THE WORK OF THE CONFERENCE**

**Agenda Item 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.

**Background Information:** At WRC-15 CITEL put forward Inter-American Proposals for an item to be placed on the draft agenda of WRC-23 and a resolution calling for supporting studies. These proposals, agreed at WRC-15, supported an allocation to the Earth exploration-satellite (active) service in the frequency range 40-50 MHz. The draft agenda item is number 2.2 in Resolution **810 (WRC-15)**, and the supporting studies are called for in Resolution **656 (WRC-15)**. The United States continues to support the retention of this item on the agenda of WRC-23.

There is an interest among space agencies in using active spaceborne sensors in the 40-50 MHz frequency range for measurements of the Earth's subsurface to provide radar maps of subsurface scattering layers with the intent to locate water/ice deposits. Measurements at the 40-50 MHz frequency range allow the discernment of details at more than 30 meters below the surface of the Earth for favorable ground conditions. Use of frequencies below 40-50 MHz would require larger antenna, which would present difficulties to spaceborne missions implementing this application. Use of frequencies above 40-50 MHz would reduce the depth at which the spaceborne radar sounder could provide measurements. Use of a frequency range other than 40-50 MHz would require new aeronautical campaigns at the different frequency in order to assess and calibrate the measurements at that frequency for use in a spaceborne radar sounder mission.

The information obtained from a spaceborne radar sounder operating in the 40-50 MHz frequency range would be of great value to ongoing global climate change studies, and to administrations in their assessment of below surface water resources within their territories. Repetitive measurements of worldwide subsurface water deposits can only be practically implemented using spaceborne active sensors.

The 40-50 MHz frequency range is allocated to the fixed, mobile and broadcasting services on a primary basis. The uses of the 40.98 to 41.015 MHz frequency band by space research service are on secondary basis. Country footnotes in the Table of Frequency Allocations for the 40-50 MHz frequency range provide primary allocations for aeronautical navigation and radiolocation services in certain parts of the world. Recommendation ITU-R RS.2042-0 provides typical technical and operating characteristics for spaceborne radar sounder systems in the 40-50 MHz band for use in interference and compatibility studies.

This future conference agenda item proposes to study the compatibility of spaceborne radar sounder operations in the 40-50 MHz frequency range with the existing allocated services. In addition, it would investigate a potential modification to the Table of Frequency Allocations to add an allocation to the Earth exploration-satellite service (active). This allocation would allow for the operation of spaceborne radar sounder systems in the 40-50 MHz frequency range.

**Proposals:**

**ADD USA/10/1**

DRAFT NEW RESOLUTION [USA-XXXX]

**Agenda for the 2023 World Radiocommunication Conference**

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

...

**X.X1** to conduct, and complete in time for WRC-23, studies for a possible new allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, in accordance with Resolution **656 (WRC-15)**;

**Reasons:** To conduct studies to examine the compatibility of spaceborne radar sounder operations in the 40-50 MHz frequency range with existing allocated services and to potentially modify the Table of Frequency Allocations to add an allocation to the Earth exploration-satellite service (active) allowing for the operation of spaceborne radar sounder systems in the 40-50 MHz frequency range.

**NOC USA/10/2**

RESOLUTION 656 (WRC-15)

**Possible allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders in the range of frequencies around 45 MHz**

The World Radiocommunication Conference (Geneva, 2015),

**Reasons:** Resolution **656 (WRC-15)** calls for the studies supporting this agenda item. Consequential changes are unnecessary.

**SUP USA/10/3**

RESOLUTION 810 (WRC-15)

**Preliminary agenda for the 2023 World Radiocommunication Conference**

The World Radiocommunication Conference (Geneva, 2015),

**Reasons:** This Resolution must be suppressed, as WRC-19 will create a new Resolution that will include the agenda for WRC-23.



**DOCUMENT WAC/062 (06.09.18)**

September 6, 2018

Mr. Tom Sullivan  
Chief, International Bureau  
Federal Communications Commission  
445 12<sup>th</sup> Street, SW  
Washington, DC 20554

Dear Mr. Sullivan:

The National Telecommunications and Information Administration (NTIA), on behalf of the Executive Branch agencies, approves the release of the enclosed proposals for the 2019 World Radiocommunication Conference (WRC-19) which address:

1. Agenda item 1.13 – International Mobile Telecommunications (IMT) studies between 24.25 GHz and 86 GHz with proposals for the 31.8-33.4 GHz, 45.5-47 GHz, and 47-47.2 GHz bands
2. Agenda item 9.1, issue 9.1.6 – Urgent studies for Wireless Power Transfer (WPT) for electric vehicles

NTIA considered the federal agencies' input toward the development of these U.S. proposals for WRC-19. NTIA forwards this package for your consideration and review. If you have any questions, please contact Mr. Charles Glass, our WRC Coordinator, who can be reached at (202) 482-1896 or [cglass@ntia.doc.gov](mailto:cglass@ntia.doc.gov).

Sincerely,

Peter A. Tenhula  
Acting Associate Administrator  
Office of Spectrum Management

Enclosures (2)

# Attachment 1

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.13

1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;

**Background Information:** Resolution **238 (WRC-15)** invites ITU-R to conduct and complete in time for WRC-19 appropriate studies to determine the spectrum needs for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, as well as sharing and compatibility studies, taking into account the protection of services to which the frequency band is allocated on a primary basis, for the frequency bands:

- 24.25-27.5 GHz<sup>1</sup>, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

The Resolution further invites WRC-19 to consider, based on the results of these studies, additional spectrum allocations to the mobile service on a primary basis and identification of frequency bands for the terrestrial component of IMT. The bands to be considered are limited to part or all of the bands listed above.

**31.8-33.4 GHz:** Sharing and compatibility studies were conducted between IMT-2020 systems and the following systems in the 31.8-33.4 GHz range: radionavigation service (RNS), space research service (Deep Space) (SRS), Earth exploration-satellite (EESS) (passive), and radio astronomy service (RAS). The results are briefly summarized as follows:

- RNS: The studies show that sharing between IMT-2020 systems and the radionavigation service within 31.8-33.4 GHz is not feasible
- SRS: The study results indicate that the separation distances needed to protect these particular facilities are relatively small; consequently, the protection of these stations could be considered on a national or bilateral/multilateral level.
- EESS (passive): The studies show interference exceedance.
- RAS: The studies show that separation distances of 19-49 km are needed.

**45.5-47 GHz:** No studies were performed between IMT-2020 systems in this band and the relevant incumbent services.

**47-47.2 GHz:** No studies were performed between IMT-2020 systems in this band and the relevant incumbent services.

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<sup>1</sup> “When conducting studies in the frequency band 24.5-27.5 GHz, to take into account the need to ensure the protection of existing earth stations and the deployment of future receiving earth stations under the EESS (space-to-Earth) and SRS (space-to-Earth) allocation in the frequency band 25.5-27 GHz.”

## ARTICLE 5

**Frequency allocations****Section IV – Table of Frequency Allocations**  
(See No. 2.1)NOC USA/4773A13/1**29.9-34.2 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>29.9-30</b>	FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.527A 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.543 5.525 5.526 5.527 5.538 5.540 5.542	
<b>30-31</b>	FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) 5.542	
<b>31-31.3</b>	FIXED 5.338A 5.543A MOBILE Standard frequency and time signal-satellite (space-to-Earth) Space research 5.544 5.545 5.149	
<b>31.3-31.5</b>	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	
<b>31.5-31.8</b> EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149 5.546	<b>31.5-31.8</b> EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  5.340	<b>31.5-31.8</b> EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149
<b>31.8-32</b>	FIXED 5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) 5.547 5.547B 5.548	

<b>32-32.3</b>	FIXED 5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) 5.547 5.547C 5.548
<b>32.3-33</b>	FIXED 5.547A INTER-SATELLITE RADIONAVIGATION 5.547 5.547D 5.548
<b>33-33.4</b>	FIXED 5.547A RADIONAVIGATION 5.547 5.547E
<b>33.4-34.2</b>	RADIOLOCATION 5.549

**Reasons:** The studies show that sharing is not feasible between IMT-2020 systems in 31.8-33.4 GHz and at least one of the incumbent services.

**NOC** USA/4773A13/2

**40-47.5 GHz**

<b>Allocation to services</b>		
<b>Region 1</b>	<b>Region 2</b>	<b>Region 3</b>
<b>40-40.5</b>	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)	
<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547
<b>41-42.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I	

42.5-43.5	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149 5.547
43.5-47	MOBILE 5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554
47-47.2	AMATEUR AMATEUR-SATELLITE
47.2-47.5	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A

**Reasons:** No studies were performed between IMT-2020 systems in the 45.5-47 GHz band or the 47-47.2 GHz band and the incumbent services; therefore, it has not been demonstrated that the incumbent services can be protected, as required by Resolution **238 (WRC-15)**.

**SUP** USA/4773A13/3

## RESOLUTION 238 (WRC-15)

### **Studies on frequency-related matters for International Mobile Telecommunications identification including possible additional allocations to the mobile services on a primary basis in portion(s) of the frequency range between 24.25 and 86 GHz for the future development of International Mobile Telecommunications for 2020 and beyond**

The World Radiocommunication Conference (Geneva, 2015),

**Reasons:** The studies called for under the agenda item for most of the bands have been completed. The fact that no studies on the 45.5-47 GHz band or the 47-47.2 GHz band, which were called for under the agenda item, have been performed indicates no interest in these bands for IMT-2020. There is no need to retain Resolution **238 (WRC-15)**.



## Attachment 2 United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 9, Issue 9.1.6

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

9.1 on the activities of the Radiocommunication Sector since WRC-15;

9.1 (9.1.6) Resolution **958 (WRC-15)** - Annex item 1) Studies concerning Wireless Power Transmission (WPT) for electric vehicles: a) to assess the impact of WPT for electric vehicles on radiocommunication services; b) to study suitable harmonized frequency ranges which would minimize the impact on radiocommunication services from WPT for electrical vehicles. These studies should take into account that the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO) and the Society of Automotive Engineers (SAE) are in the process of approving standards intended for global and regional harmonization of WPT technologies for electric vehicles;

#### **Background Information:**

WPT technologies are being developed worldwide to support many applications to transfer power without employing any wired connection. WPT for electric vehicles (WPT EV) applications are part of the WPT development efforts. The objectives of WPT EV developments are to reduce EV battery size, increase the driving distance between charging, and improve the practicality by making EV charging stations more available and accessible for consumers, governments, and other public transit authorities.

WRC-15 adopted Resolution **958 (WRC-15)** to examine the possible impact of WPT EV charging on the radiocommunication services. Annex item 1 of the resolution requests, as a matter of urgency, that ITU-R study the impact of WPT EV on radiocommunication services and study suitable harmonized frequency ranges that would minimize this impact. ITU-R identified two frequency ranges for EV charging that might be suitable for harmonization: the 79-90 kHz frequency range for medium power and 19-25 kHz for high power. ITU-R conducted a number of impact studies between WPT EV and radiocommunication services to assess the potential interference impact of WPT EV applications operating within the 19-25 kHz and 79-90 kHz frequency ranges. These analyses are included in Report ITU-R SM.2303, [the working document towards a preliminary draft new] Report SM.[WPT\_SPEC\_MNGM], and [the working document towards a preliminary draft revision of] Recommendation ITU-R SM.2110. Upon approval of these documents, the urgent studies requested in Resolution **958 (WRC-15)** Annex 1 (b) will have been addressed.

The power level of WPT EV selected to charge an EV battery will depend on the circumstances and requirements of the users. In most cases for electric vehicles, the charger will be located in a residential setting, with power levels between 3.3 kW and 22 kW. It will likely take a number of hours to fully charge the EV battery within this power range. These characteristics provide a suitable balance between domestic electrical load limitations, charging time considerations, and other regulations governing electrical installations for domestic use. However, where users need higher charging rates to satisfy specific heavy-duty vehicle use (such as buses, trams, and trucks), much higher power levels may be needed to reduce the charging times to satisfy commercial and operational demands. A minimum of 75 kW equivalent charging power is likely to be required initially, and the requirement will increase to several hundred kW for certain intensively used heavy-duty vehicles.

WPT does not have any status in the Radio Regulations; therefore, it should not cause interference to radiocommunication services. For the frequency ranges proposed for harmonized WPT EV use, Nos. **15.12** and

**15.12.1** apply to ensure that electrical apparatus of any kind does not cause harmful interference to a radiocommunication service and that administrations should be guided by the latest ITU-R Recommendations in this matter. Recommendation ITU-R SM.2110 provides further information on the regulatory status of WPT.

**NOC** USA/4775A21A6/1

## ARTICLE 5

### Frequency allocations

**Reasons:** Based on ITU-R studies conducted and analyses made per Resolution **958 (WRC-15)** Annex 1, the impact on radiocommunication services from WPT EV can be minimized by the application of power limits, separation distances, and careful control of harmonic energy, including the selection of WPT EV fundamental frequency within the frequency ranges.<sup>2</sup> Further, [working document towards a preliminary draft new] Report ITU-R SM.[WPT\_SPEC\_MNGM] provides the required power limitations and associated frequency ranges.

Therefore, it is unnecessary to make any modifications to the Radio Regulations or to the regulatory status of WPT for the introduction of WPT EV applications. These applications can be developed, deployed, and used effectively within the existing regulatory framework in accordance with Nos. **15.12** and **15.12.1** and regional and individual administration's authorization requirements. Additional guidance for administrations wishing to deploy WPT EV applications can be found in ITU-R Reports and Recommendations, including [the working document towards a preliminary draft new] Report ITU-R SM.[WPT\_SPEC\_MNGM] and the latest version of Recommendation ITU-R SM. 2110.

## RESOLUTION 958 (WRC-15)

### Urgent studies required in preparation for the 2019 World Radiocommunication Conference

**SUP** USA/4775A21A6/2

## ANNEX TO RESOLUTION 958 (WRC-15)

### Urgent studies required in preparation for the 2019 World Radiocommunication Conference

- 1) Studies concerning Wireless Power Transmission (WPT) for electric vehicles:
  - a) to assess the impact of WPT for electric vehicles on radiocommunication services;
  - b) to study suitable harmonized frequency ranges which would minimize the impact on radiocommunication services from WPT for electrical vehicles.

These studies should take into account that the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO) and the Society of Automotive Engineers (SAE) are in the process of approving standards intended for global and regional harmonization of WPT technologies for electric vehicles.

- 2) Studies to examine:
  - a) whether there is a need for possible additional measures in order to limit uplink transmissions of terminals to those authorized terminals in accordance with No. **18.1**;

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<sup>2</sup> The fundamental frequency selection may need to take into account regional differences.

- b) the possible methods that will assist administrations in managing the unauthorized operation of earth station terminals deployed within its territory, as a tool to guide their national spectrum management programme, in accordance with Resolution ITU-R 64 (RA-15).
- 3) Studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonized use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures, in order to develop Recommendations, Reports and/or Handbooks, as appropriate, and to take appropriate actions within the ITU Radiocommunication Sector (ITU-R) scope of work

**Reasons:** The studies called for under the Resolution have been completed. No changes to the Radio Regulations are required. Further studies can be carried out under normal ITU-R procedures in the relevant working parties.

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**DOCUMENT WAC/074 (21.09.18)**

**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Telecommunications and**  
**Information Administration**  
 Washington, D.C. 20230

Mr. Tom Sullivan  
 Chief, International Bureau  
 Federal Communications Commission  
 445 12<sup>th</sup> Street, SW  
 Washington, DC 20554

Dear Mr. Sullivan:

The National Telecommunications and Information Administration (NTIA), on behalf of the Executive Branch agencies, approves the release of the enclosed proposals for the 2019 World Radiocommunication Conference (WRC-19) which address:

1. Agenda Item 1.2– Power Limits for MSS/MetSat/EESS Earth Stations around 400 MHz
2. Agenda Item 1.3– Revision of NTIA proposal on MetSat upgrade / EESS allocation (space-to-Earth) at 460-470 MHz
3. Agenda Item 1.6– Regulatory Framework for non-GSO FSS at 37.5-39.5 GHz (□) & 47.2-50.2 GHz (□)
4. Agenda Item 1.13 (24.25-27.5 GHz) – International Mobile Telecommunications (IMT) studies between 24.25-86 GHz
5. Agenda Item 1.13 (37-40.5 GHz) – International Mobile Telecommunications (IMT) studies between 24.25-86 GHz
6. Agenda Item 1.13 (47.2-50.2 GHz) – International Mobile Telecommunications (IMT) studies between 24.25-86 GHz
7. Agenda Item 1.13 (50.4-52.6 GHz) – International Mobile Telecommunications (IMT) studies between 24.25-86 GHz
8. Agenda Item 1.13 (81-86 GHz) – International Mobile Telecommunications (IMT) studies between 24.25-86 GHz
9. Agenda Item 1.14– High Altitude Platform Systems (HAPS)
10. Agenda Item 4– Resolutions and Recommendations Review
11. Agenda Item 7 (Issue A) – Resolution 86 – Satellite Regulatory Procedures
12. Agenda Item 7 (Issue H) – Resolution 86 – Satellite Regulatory Procedures
13. Agenda Item 7 (Issue I) – Resolution 86 – Satellite Regulatory Procedures
14. Agenda Item 9.1, Issue 9.1.4– Stations on board sub-orbital vehicles
15. Agenda Item 9.1, Issue 9.1.9– FSS (□) studies at 51.4-52.4 GHz
16. Agenda Item 10 (RFI Sensors) – Future Conference Agenda Items
17. Agenda Item 10 (Sub-orbital Vehicles) – Future Conference Agenda Items

NTIA considered the federal agencies' input toward the development of these U.S. proposals for WRC-19. NTIA forwards this package for your consideration and review. If you have any questions, please contact Mr. Charles Glass, our WRC Coordinator, who can be reached at (202) 482-1896 or [cglass@ntia.doc.gov](mailto:cglass@ntia.doc.gov).

Sincerely,

Peter A. Tenhula  
Acting Associate Administrator  
Office of Spectrum Management

Enclosures (17)

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.2

**Agenda Item 1.2:** *to consider in-band power limits for earth stations operating in the mobile-satellite service, meteorological-satellite service, and Earth exploration-satellite service in the frequency bands 401-403 MHz and 399.9-400.05 MHz, in accordance with Resolution 765 (WRC-15)*

**BACKGROUND:** Resolution 765 (WRC-15) resolves to invite the WRC-19 to take into account the results of ITU-R studies and consider the possibility of establishing in-band power limits for Earth stations in the EESS and MetSat in the frequency bands 401- 403 MHz and in the MSS frequency band 399.9-400.05 MHz.

Earth stations operating in the Earth exploration-satellite service (EESS) and meteorological-satellite service (MetSat) in the frequency band 401-403 MHz and in the mobile-satellite service (MSS) in the frequency band 399.9-400.05 MHz are used for data collection systems (DCS) uplinks. These DCS usually operate most efficiently together by using moderate to low equivalent isotropic radiated power (e.i.r.p) levels, resulting in small link margins.

Recommendation ITU-R SA.2045 provides information on the performance and interference criteria for relevant geostationary-satellite orbit (GSO) and non-geostationary satellite (non-GSO) DCS in the frequency band 401-403 MHz. Recommendation ITU-R SA.2044 provides information on the current and future usage of non-GSO DCS in the frequency band 401-403 MHz, and the portioning of the frequency band to allow all DCS equal access to the spectrum. Recommendation ITU-R M.2046 provides a description, and the corresponding protection criteria for broadband noise and narrowband interference, of one MSS system that uses the frequency band 399.9-400.05 MHz (Earth-to-space).

Tens of thousands of DCS stations communicating with GSO and non-GSO satellites are deployed worldwide for the purpose of collecting essential weather and climate data. The Data Collection Platforms (DCP) gather information activity related to the Earth, environmental and scientific applications, weather, environment observation: meteorological and oceanographic, seismic observation, volcanology, geodesy and geodynamics, fishing vessel monitoring, wildlife tracking, homeland security, law enforcement, test/evaluation, monitoring shipments of dangerous goods, humanitarian applications, managing water resources or tsunami warning system, etc. The data collected by DCPs are transmitted to satellites in visibility of these platforms that relay the retrieved information to dedicated earth stations. EESS, MetSat, and MSS systems are indispensable for monitoring and predicting climate change; monitoring oceans, weather, and water resources. Additionally, these systems assist in protecting biodiversity, and improve maritime safety, and security.

There is a growing number of satellite operators planning to use these frequency bands for telecommand purposes under the EESS, MetSat, and MSS allocations. The output power levels of these Earth stations at the antenna port for telecommand links (Earth-to-space) can be much higher than the moderate to low power levels traditionally used for the operation of EESS, MetSat, and MSS DCS systems, in the frequency bands 401-403 MHz and 399.9-400.05 MHz.

ITU-R study is considering specific in-band power limits for earth stations operating in the frequency ranges 399.9-400.05 MHz in the MSS and 401-403 MHz in the EESS and MetSat services.

Proposal:

## ARTICLE 5

**Frequency allocations****Section IV – Table of Frequency Allocations**

(See No. 2.1)

**MOD USA/AI 1.2/1****335.4-410 MHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>399.9-400.05</b>	MOBILE-SATELLITE (Earth-to-space) 5.209 5.220 ADD 5.A102	
<b>400.05-400.15</b>	STANDARD FREQUENCY AND TIME SIGNAL-SATELLITE (400.1 MHz) 5.261 5.262	
<b>400.15-401</b>	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) 5.263 Space operation (space-to-Earth) 5.262 5.264	
<b>401-402</b>	METEOROLOGICAL AIDS SPACE OPERATION (space-to-Earth) EARTH EXPLORATION-SATELLITE (Earth-to-space) ADD 5.B102 5.C102 METEOROLOGICAL-SATELLITE (Earth-to-space) ADD 5.B102 5.C102 Fixed Mobile except aeronautical mobile	
<b>402-403</b>	METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (Earth-to-space) ADD 5.B102 5.C102 METEOROLOGICAL-SATELLITE (Earth-to-space) ADD 5.B102 5.C102 Fixed Mobile except aeronautical mobile	

**Reason:** ITU-R studies results have shown a need to provide in-band power limits applicable to Earth stations in order to ensure the existing and future operation of DCS in the MSS, EESS, and MetSat service will continue to operate without interference.



**ADD USA/AI 1.2/2**

**5.A102** In the frequency band 399.9-400.03 MHz, the maximum e.i.r.p. transmission at the input of the antenna from any Earth stations (Earth-to-space) in the mobile-satellite service shall not exceed 5 dBW. This limit shall apply after 22 November 2024 for which complete notification information is received by the Radiocommunication Bureau before 22 November 2019. Administrations are encouraged to take all efforts to comply with the maximum e.i.r.p. limits in the frequency band 399.9-400.03 MHz prior to 22 November 2024.

**Reasons:** Establish Earth station maximum e.i.r.p. limit to ensure the continued operations of non-GSO data collection systems in the frequency band.

**ADD USA/AI 1.2/3**

**5.B102** In the frequency band 401-403 MHz, the maximum e.i.r.p. transmission at the input of the antenna from any Earth stations (Earth-to-space) in the **meteorological-satellite service and the Earth exploration-satellite service shall not exceed 22 dBW for geostationary-satellite orbit systems and non-geostationary-satellite orbit systems with an orbital apogee equal to or greater than 35 786 km and 7 dBW for non-geostationary-satellite orbit systems with an orbital apogee lower than 35 786 km.**

**These provisions shall apply to all Earth stations (Earth-to-space) in the meteorological-satellite service and the Earth exploration-satellite service operating in this frequency band after 1 January 2024. These limits shall not apply to all Earth stations (Earth-to-space) of associated satellite systems in the meteorological-satellite service and the Earth exploration-satellite service in this frequency band for which complete notification information has been received by the Radiocommunication Bureau before 22 November 2019.**

**Reasons:** Establish Earth station e.i.r.p. limits to ensure the operations of both GSO and non-GSO data collection systems in the 401-403 MHz frequency band.

**ADD USA/AI 1.2/4**

**5.C102** In the frequency band 401.898-402.522 MHz, the maximum e.i.r.p. transmission at the input of the antenna from **Earth stations (Earth-to-space) of associated satellite system for which complete notification information was received by the Radiocommunication Bureau on 28 April 2007, may continue to operate at their current level.**

**Reasons:** This provision provide flexibility to existing Earth station(s) of associated non-GSO system and it ensure the continued operation of this non-GSO data collection systems.

SUP USA/AI 1.2/5

RESOLUTION 765 (WRC-15)  
**Establishment of in-band power limits for earth stations operating  
in mobile-satellite service, the meteorological-satellite service and  
the Earth exploration-satellite service in the frequency bands  
401-403 MHz and 399.9-400.05 MHz**

**Reasons:** Consequential actions to establishing in-band power limits for Earth stations operating in the mobile-satellite service, the meteorological-satellite service and the Earth-exploration-satellite service in the frequency bands 399.9-400.05 MHz and 401-403 MHz.

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## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.3

**Agenda Item 1.3:** *to consider possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a possible primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz, in accordance with Resolution 766 (WRC-15)*

**BACKGROUND:** The 460-470 MHz frequency band is allocated on a primary basis to the fixed and mobile services. The meteorological-satellite service currently has a secondary allocation in this band. Under No. 5.289, “Earth exploration-satellite service applications, other than the meteorological-satellite service, may also be used in the bands 460-470 MHz for space-to-Earth transmissions subject to not causing harmful interference to stations operating in accordance with the Table”.

Within this frequency band, the Argos Data Collection System (ADCS) monitors more than 21,000 active Argos platforms collecting data for over 2,000 distinct projects in 100+ countries. The administration of the Argos program is under a joint agreement between the National Oceanic and Atmospheric Administration (NOAA) within the United States and the French Space Agency, Centre National d’Etudes Spatiales (CNES). Additional partners include the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), and the Indian Space Research Organization (ISRO).

Critical applications of the ADCS include atmospheric and ocean monitoring/research, tropical cyclone forecasting, fishery management, oil spill tracking, fishing vessel tracking, search and rescue modeling (at sea), anti-piracy alerting, import/export and hazardous materials tracking, endangered species studies, migration mapping, and wildlife tracking and management.

The meteorological-satellite (space-to-Earth) service operates on a secondary basis relative to the fixed and mobile services and thus it must not interfere with these services. To protect the fixed and land mobile services within the United States, a power flux density (pfd) of -152 dB(W/(m<sup>2</sup>·4kHz)) has been imposed on the meteorological-satellite (space-to-Earth) service.

In accordance with Resolution 766 (WRC-15), the ITU-R has conducted sharing studies to ensure the protection of incumbent services and to develop a pfd limit that will protect incumbent services globally from potential interference in the frequency band 460 – 470 MHz.

Studies have demonstrated that sharing is possible between meteorological-satellite (space-to-Earth)/earth-exploration-satellite (space-to-Earth) services and the incumbent services in the 460 – 470 MHz frequency band if the pfd limits proposed below are applied. Based on the results of sharing studies, this proposal supports an allocation upgrade from secondary to a primary for the meteorological-satellite service (space-to-Earth) and a new primary allocation to the earth-exploration-satellite (space-to-Earth) service in the frequency band 460 – 470 MHz band. This proposal applies a set of elevation angle dependent pfd limits to the meteorological-satellite and earth exploration-satellite services to protect the incumbent services globally.



Proposal:

**ARTICLE 5**  
**Frequency allocations**

**Section IV – Table of Frequency Allocations**  
(See No. 2.1)

**MOD** USA/AI 1.3/1

460-470 MHz

Allocation to services		
Region 1	Region 2	Region 3
460-470	FIXED MOBILE 5.286AA METEOROLOGICAL-SATELLITE (space-to-Earth) EARTH-EXPLORATION-SATELLITE (space-to-Earth)  5.287 5.288 5.290 ADD 5.A103 ADD 5.B103 ADD 5.C103	

**Reason:** The upgrade from the secondary MetSat and EESS allocations to primary will bring regulatory stability and certainty to the space agencies involved in Satellite Data Collection Programs. With this upgrade, inclusion of this band in footnote 5.289 is no longer necessary. Also, this upgraded allocation will ease coordination effort for Administrations.

**ADD** USA/AI 1.3/2

**5.A103** In the frequency band 460-470 MHz, Resolution [B103] (WRC-19) shall apply. (WRC-19)

**MOD** USA/AI 1.3/3

Allocation to services		
Region 1	Region 2	Region 3
<b>1 690-1 700</b> METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) Fixed Mobile except aeronautical mobile  MOD 5.289 5.341 5.382	<b>1 690-1 700</b> METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth)  MOD 5.289 5.341 5.381	
<b>1 700-1 710</b> FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile  MOD 5.289 5.341		<b>1 700-1 710</b> FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile  MOD 5.289 5.341 5.384

**MOD** USA/AI 1.3/4

**5.289** Earth exploration-satellite service applications, other than the meteorological-satellite service, may also be used in the band 1 690-1 710 MHz for space-to-Earth transmissions subject to not causing harmful interference to stations operating in accordance with the Table. (Rev. WRC-19)

## APPENDIX 7 (REV.WRC-15)

### Methods for the determination of the coordination area around an earth station in frequency bands between 100 MHz and 105 GHz

ANNEX 7

**System parameters and predetermined coordination distances for determination of the coordination area around an earth station**

**3 Horizon antenna gain for a receiving earth station with respect to a transmitting earth station**

MOD USA/AI 1.3/5

TABLE 8A (REV.WRC-19)

**Parameters required for the determination of coordination distance for a receiving earth station**

Receiving space radiocommunication service designation		Space operation, space research	Meteorological-satellite, mobile-satellite	Space research	Space research, space operation	Space operation	Mobile-satellite	Meteorological-satellite	Mobile-satellite	Space research	Space operation		Broad-casting-satellite	Mobile-satellite	Broadcasting-satellite (DAB)	Mobile-satellite, land-mobile satellite, maritime mobile-satellite
Frequency bands (MHz)		137-138	137-138	143.6-143.65	174-184	163-167 272-273 <sup>5</sup>	335.4-399.9	400.15-401	400.15-401	400.15-401	401-402		620-790	856-890	1 452-1 492	1 518-1 530 1 555-1 559 2 160-2 200 <sup>1</sup>
Transmitting service designations		terrestrial Fixed, mobile	Fixed, mobile	Fixed, mobile, radio-location	Fixed, mobile, broadcasting	Fixed, mobile	Fixed, mobile	Meteorological aids	Meteorological aids	Meteorological aids	Meteorological aids, fixed, mobile		Fixed, mobile, broadcasting	Fixed, mobile, broadcasting	Fixed, mobile, broadcasting	Fixed, mobile
Method to be used		§ 2.1	§ 2.1	§ 2.1	§ 2.1	§ 2.1	§ 1.4.6	§ 1.4.6	§ 1.4.6	–	§ 2.1		§ 1.4.5	§ 1.4.6	§ 1.4.5	§ 1.4.6
Modulation at earth station <sup>2</sup>		N		N		N				N	N				N	N
Earth interference parameters and criteria	station $p_0$ (%)	0.1		0.1		1.0		0.012		0.1	0.1					10
	$n$	2		2		1		1		2	2					1
	$p$ (%)	0.05		0.05		1.0		0.012		0.05	0.05					10
	$N_L$ (dB)	0		0		0		0		0	0					0
	$M_s$ (dB)	1		1		1		4.3		1	1					1
	$W$ (dB)	0		0		0		0		0	0					0
Terrestrial parameters	station $E$ (dBW) in $B$ <sup>3</sup>	A	–	–		15				–	–				38	37 <sup>4</sup>

		N	–		–		15				–	–			38	37
	$P_t$ (dBW) in $B$	A	–		–		–1				–	–			3	0
		N	–		–		–1				–	–			3	0
	$G_x$ (dBi)		–		–		16				–	–			35	37
Reference bandwidth	$B$ (Hz)		1		1		$10^3$		$177.5 \times 10^3$		1	1			$25 \times 10^3$	$4 \times 10^3$
Permissible interference power	$P_r(p)$ (dBW) in $B$		–199		–199		–173		–148		–208	–208				–176

- <sup>1</sup> In the band 2 160-2 200 MHz, the terrestrial station parameters of line-of-sight radio-relay systems have been used. If an administration believes that, in this band transhorizon systems need to be considered, the parameters associated with the frequency band 2 500-2 690 MHz may be used to determine the coordination area.
- <sup>2</sup> A: analogue modulation; N: digital modulation.
- <sup>3</sup>  $E$  is defined as the equivalent isotropically radiated power of the interfering terrestrial station in the reference bandwidth.
- <sup>4</sup> This value is reduced from the nominal value of 50 dBW for the purposes of determination of coordination area, recognizing the low probability of high power emissions falling fully within the relatively narrow bandwidth of the earth station.
- <sup>5</sup> The fixed-service parameters provided in the column for 163-167 MHz and 272-273 MHz are only applicable to the band 163-167 MHz.

**Reason:** Consequential changes to AP 7 to remove the Meteorological Satellite Service given the proposed 5.A103.



ADD USA/AI 1.3/6

DRAFT NEW RESOLUTION [B103] (WRC-19)

**Implementation of satellite networks and systems of the meteorological-satellite service (space-to-Earth) and the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz**

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

*considering*

- a) that data collection systems (DCS) operate on geostationary and non-geostationary orbits in the meteorological-satellite service (MetSat) and the Earth exploration-satellite service (EESS) (Earth-to-space) in the frequency band 401-403 MHz;
- b) that DCS are essential for monitoring and predicting climate change, monitoring oceans, and water resources, weather forecasting and assisting in protecting biodiversity, improving maritime security;
- c) that most of these DCS have implemented satellite downlinks (space-to-Earth) in the frequency band 460-470 MHz which bring significant improvements to the operation of satellite DCS, such as the transmission of information to optimize the usage of the terrestrial data collection platforms;
- d) that the frequency band 460-470 MHz is also used for the downlink of mission and telemetry data for meteorological and earth exploration purposes;
- e) that the frequency band 460-470 MHz is allocated to the fixed and mobile services on a primary basis and is widely used by these services;
- f) that the WRC-19 has upgraded the secondary allocation of the MetSat (space-to-Earth) to primary status and added a primary allocation to the EESS (space-to-Earth) in the frequency band 460-470 MHz, and established the power flux-density (pfd) limit to provide protection of existing terrestrial services;
- g) that the priority of MetSat systems over EESS systems in the frequency band 460-470 MHz is provided to ensure protection of MetSat systems from interference from the increasing number of small satellite systems operating in the EESS;
- h) that WRC-19 suppress No. 5.290 and the relevant parameters in Table 8a of Appendix 7, which identified some administrations that already have a primary allocation to the MetSat (space-to-Earth), subject to agreement obtained under No. 9.21, in the light of the upgrade mentioned in *considering f* above, and that it is necessary to provide some regulatory measures for satellite systems which operate in accordance with No. 5.290 to retain their regulatory status after the end of WRC-19,

*noting*

- a) that several EESS and MetSat satellite systems in the frequency band 460-470 MHz were notified and brought into use;

b) that some of these EESS and MetSat satellite systems above may not meet the pfd limit in *considering f*), but there is a need to authorize them under the previous provision in order to continue their operations,

*resolves*

1 that in the frequency band 460-470 MHz, in order to protect systems of the fixed and mobile services, the power flux-density at the Earth's surface produced by stations in the meteorological-satellite (space-to-Earth) and earth exploration-satellite (space-to-Earth) services shall comply with the limits listed below under assumed free-space propagation conditions for all methods of modulation:

For non-GSO space stations:

$$\text{pfd} \left( \text{dB} \left( \frac{\text{W}}{\text{m}^2 \cdot 4\text{kHz}} \right) \right) = \begin{cases} -157 & 0^\circ \leq \alpha < 5^\circ \\ -157 + 0.5(\alpha - 5) & 5^\circ \leq \alpha < 15^\circ \\ -152 & 15^\circ \leq \alpha \leq 90^\circ \end{cases}$$

And for GSO space stations:

$$\text{pfd} (\text{dBW}/(\text{m}^2 \cdot 4\text{kHz})) = \begin{cases} -162 & 0^\circ \leq \alpha \leq 15^\circ \\ -162 + 0.5(\alpha - 15) & 15^\circ < \alpha < 35^\circ \\ -152 & 35^\circ \leq \alpha \leq 90^\circ \end{cases}$$

where  $\alpha$  is the angle of arrival above the horizontal plane, in degrees. (WRC-19).

These limits apply to all space stations in the meteorological-satellite service and Earth exploration-satellite service in this frequency band for which complete notification information or coordination request was received by the Radiocommunication Bureau after the end of WRC-19;

2 that the satellite networks and systems in the meteorological-satellite (space-to-Earth) and Earth exploration-satellite (space-to-Earth) services in the frequency band 460-470 MHz for which a complete coordination request or notification information has been received by the Radiocommunication Bureau prior to the end of WRC-19 are allowed to continue to operate with the same parameters under Appendix 4 submitted for coordination or notification;

3 that the frequency assignment of MetSat (space-to-Earth) and EESS (space-to-Earth) satellite network and systems in the frequency band 460-470 MHz for which complete notification information or coordination request was received by the Radiocommunication Bureau prior to the end of WRC-19 and which space stations do not meet the pfd limits given in *resolves* 1 shall be used on a secondary basis with respect to the fixed and mobile service stations;

4 that the satellite systems in the meteorological-satellite service (space-to-Earth) referred to in *considering h*) for which complete coordination information related to No. 9.21 has been received by the Radiocommunication Bureau prior to the end of WRC-19 can operate on a primary basis, and that, for those systems, the relevant provisions of Articles 9 and 11 continue to apply, and the relevant agreements obtained under No. 9.21 remain in force after the end of WRC-19;

5 that in the frequency band 460-470 MHz, Earth stations in the meteorological satellite service (space-to-Earth) and Earth exploration-satellite service (space-to-Earth) shall not claim protection from stations of the fixed and mobile services and No. 5.43A does not apply;

6 that in the frequency band 460-470 MHz, stations in the Earth exploration-satellite service (space-to-Earth) shall not cause harmful interference to Earth stations in the meteorological-satellite service (space-to-Earth),

*instructs the Director of the Radiocommunication Bureau*

for the frequency assignment of MetSat (space-to-Earth) and EESS (space-to-Earth) satellite network for which complete notification information or coordination request was received by the Radiocommunication Bureau prior to the end of WRC-19, the Bureau shall review the finding under No. 11.50 without proposal to the administration that it submit a new assignment to replace the previous one. The date of such assignment original recording in the Master International Frequency Register (MIFR) shall be kept.

SUP USA/AI 1.3/7

## RESOLUTION 766 (WRC-15)

### **Consideration of possible upgrading of the secondary allocation to the meteorological-satellite service (space-to-Earth) to primary status and a primary allocation to the Earth exploration-satellite service (space-to-Earth) in the frequency band 460-470 MHz**

**Reasons:** ITU-R studies have shown that an upgrade to a primary allocation for meteorological-satellite service (space-to-Earth) and earth-exploration satellite service (space-to-Earth) are compatible with the incumbent services and there is no further need for this resolution.

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## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.6

**Agenda Item 1.6:** to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution **159 (WRC-15)**;

#### **BACKGROUND:**

Article **22** of the Radio Regulations contains provisions to ensure compatibility of non-geostationary (non-GSO) fixed-satellite service (FSS) operations with geostationary (GSO) networks. There are currently no defined technical provisions for sharing between non-GSO systems and GSO networks in the 50/40 GHz frequency bands. Moreover, there are no existing mechanisms in the RR establishing coordination procedures applicable to non-GSO systems operating within the FSS allocations in frequency bands in the 37.5 to 51.4 GHz range, such as application of RR No. **9.12**. This also contributes to uncertainty among potential operators of non-GSO satellite systems in these bands.

To address these issues, WRC-15 established agenda item 1.6 for WRC-19: *“to consider the development of a regulatory framework for non-GSO FSS satellite systems that may operate in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space), in accordance with Resolution **159 (WRC-15)**” which invites the ITU-R membership to contribute to “Studies of technical, operational issues and regulatory provisions for non-GSO fixed-satellite services satellite systems in the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space).”* Developing a regulatory framework in the 50/40 GHz band could provide regulatory certainty to allow non-GSO satellite systems to efficiently operate in these existing FSS frequency bands.

ITU-R studies have concluded that sharing between non-GSO and GSO FSS systems is possible in these frequency bands. The ITU-R has also been working on the development of a new Recommendation to identify means and a methodology to define a protection criteria for sharing by FSS systems in the 50/40 GHz bands. The methodology in this Recommendation and proposed protection criteria considers both the short term performance objectives and long term time-average bandwidth efficiency to enable use of these frequency bands by non-GSO FSS systems that will ensure protection of GSO FSS networks. ITU-R studies have confirmed that the application of the procedures in the new Recommendation allows for flexibility in the design and operation of non-GSO systems, while fully protecting GSO operations, therefore significantly enhancing spectrum efficiency for FSS networks in the 50/40 GHz bands.

This proposal presents a regulatory solution for providing certainty and technical provisions to allow for sharing between non-GSO and GSO systems and for protection of Earth-exploration satellite service (EESS) (passive) systems under WRC-19 agenda item 1.6. This proposal has been developed based on sharing study results in the ITU-R to identify a methodology to allow for maximum spectrum efficiency for both non-GSO and GSO FSS systems, while providing for protections for operations of GSO FSS systems from operations of non-GSO networks. Additionally, this proposal provides a regulatory solution to ensure that aggregate emissions from operating non-GSO networks do not exceed aggregate protection requirements of GSO FSS systems.

Four methods are identified in the draft CPM Report as a potential solution for WRC-19 agenda item 1.6. All four methods propose a similar approach to address issues related to non-GSO and GSO sharing including a regulatory framework based upon a single entry and aggregate allowance of unavailability and time-average bandwidth efficiency and a resolution to track aggregate effects from multiple NGSO system to ensure GSO protections. All four methods also propose a modification to Article 9 to address coordination for NGSO systems in the 50/40 GHz bands.

Regarding protections of EESS (passive) and modifications to Resolution **750 (Rev. WRC-15)**, the four methods present a range of options for protections of EESS (passive) systems in the 50.2-50.4 GHz

bands. Method D specifically proposed changes to both GSO and NGSO FSS earth station out of band emission limits as studies have shown that GSO FSS systems alone cause exceedance the EESS (passive) protection criteria and that in order to allow the aggregate interference from both GSO and NGSO FSS earth stations emission to meet this criteria modifications to both limits are needed.

This proposal tracks closely with Method D in the draft CPM Report.

**Proposal:**

**ARTICLE 5**

**Frequency allocations**

**Section IV – Table of Frequency Allocations**

(See No. 2.1)

MOD USA/1.6/1

**34.2-40 GHz**

Allocation to services		
Region 1	Region 2	Region 3
34.2-34.7	RADIOLOCATION SPACE RESEARCH (deep space) (Earth-to-space) 5.549	
34.7-35.2	RADIOLOCATION Space research 5.550 5.549	
35.2-35.5	METEOROLOGICAL AIDS RADIOLOCATION 5.549	
35.5-36	METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.549 5.549A	
36-37	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) 5.149 5.550A	

<b>37-37.5</b>	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) 5.547
<b>37.5-38</b>	FIXED FIXED-SATELLITE (space-to-Earth) ADD 5.A16 MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547
<b>38-39.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) ADD 5.A16 MOBILE Earth exploration-satellite (space-to-Earth) 5.547
<b>39.5-40</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5.A16 MOBILE MOBILE-SATELLITE (space-to-Earth) ADD 5.B16 Earth exploration-satellite (space-to-Earth) 5.547

### 40-47.5 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>40-40.5</b>	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5. A16 MOBILE MOBILE-SATELLITE (space-to-Earth) ADD 5.B16 SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)	
<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) ADD 5.484A BROADCASTING BROADCASTING-SATELLITE Mobile  5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5. A16 BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) ADD 5. A16 BROADCASTING BROADCASTING-SATELLITE Mobile  5.547
<b>41-42.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B ADD 5. A16 BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I	

<b>47.2-47.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5. A16 MOBILE 5.552A
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MOD USA/1.6/2

**47.5-51.4 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>47.5-47.9</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.A16 (space-to-Earth) 5.516B 5.554A MOBILE	<b>47.5-47.9</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.A16 MOBILE	
<b>47.9-48.2</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.A16 MOBILE 5.552A	
<b>48.2-48.54</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 ADD 5.A16 (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	<b>48.2-50.2</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.516B MOD 5.338A 5.552 ADD 5.A16 MOBILE	
<b>48.54-49.44</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.149 5.340 5.555		
<b>49.44-50.2</b> FIXED FIXED-SATELLITE (Earth-to-space) MOD 5.338A 5.552 (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	5.149 5.340 5.555	
<b>50.2-50.4</b>	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340	
<b>50.4-51.4</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE Mobile-satellite (Earth-to-space)	

**Reasons:** Add footnote to Article 5 to identify new coordination requirements between NGSO FSS systems

**ADD** USA/1.6/4

**5.A16** The use of the frequency bands 37.5-39.5 GHz (space-to-Earth), 39.5-42.5 GHz (space-to-Earth), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) by a non-geostationary-satellite system in the fixed-satellite service is subject to the application of the provisions of No. 9.12 for coordination with other non-geostationary-satellite systems in the fixed-satellite service, but not with non-geostationary systems in other services. Draft new Resolution **[A16] (WRC-19)** shall also apply, and No. 22.2 shall continue to apply. (WRC-19)

**Reasons:** To address coordination among non-GSO and mobile-satellite service (space-to-Earth) FSS systems in the 50/40 GHz bands

**ADD** USA/1.6/5

**5.B16** The use of the frequency bands 39.5-40 and 40-40.5 GHz by the mobile-satellite service (space-to-Earth) and non-geostationary-satellite systems in the fixed-satellite service (space-to-Earth) is subject to coordination under No. 9.11A. (WRC-19).

**Reasons:** To address coordination among non-GSO and mobile-satellite service (space-to-Earth) FSS systems in the 50/40 GHz bands

**MOD** USA/1.6/6

**5.338A** In the frequency bands 1 350-1 400 MHz, 1 427-1 452 MHz, 22.55-23.55 GHz, 30-31.3 GHz, 49.7-50.2 GHz, 50.4-50.9 GHz, 51.4-52.6 GHz, 81-86 GHz and 92-94 GHz, Resolution 750 (Rev.WRC-19) applies. (WRC-19)

**Reasons:** Consequential change



## ARTICLE 9

### **Procedure for effecting coordination with or obtaining agreement of other administrations<sup>1, 2, 3, 4, 5, 6, 7, 8, 9</sup> (WRC-15)**

#### **Section II – Procedure for effecting coordination<sup>12, 13</sup>**

##### **Sub-Section IIA – Requirement and request for coordination**

MOD USA/1.6/7

**9.35** *a)* examine that information with respect to its conformity with No. **11.31**<sup>MOD19</sup>; (WRC-2019)

**Reasons:** Update new requirements for the Bureau in examining new notifications

MOD USA/1.6/8

<sup>19</sup> **9.35.1** The Bureau shall include the detailed results of its examination under No. **11.31** of compliance with the limits in Tables 22-1 to 22-3 and the single entry limits in No. **22.5L** of Article 22 in the publication under No. 9.38. (WRC-2019)

**Reasons:** Identify single entry limits for the Bureau to examine for compliance

## ARTICLE 22

### Space services<sup>1</sup>

ADD USA/1.6/9

**22.5M** Administrations operating or planning to operate non-geostationary-satellite systems in the fixed-satellite service in the frequency bands 37.5-39.5, 39.5-42.5, 47.2-50.2, and 50.4-51.4 GHz shall apply the provisions of Resolution [A16] (WRC-19) to ensure that the aggregate interference into geostationary fixed and broadcasting satellite service networks caused by all non-geostationary fixed-service satellite systems operating co-frequency in these frequency bands should not exceed 10% of the time allowance for degradation in terms of C/N specified in the short term and long term performance objectives of the geostationary reference links listed in Recommendation ITU-R S.[50/40 REFERENCE LINKS]. (WRC-19)

**Reasons:** Based on ITU-R studies, the detailed technical regulatory provisions presented above will introduce technical regulatory provisions into the Radio Regulations that will enable the introduction of non-GSO satellite systems that will protect GSO systems and provide for maximum spectral efficiency for FSS operations in the 50/40 GHz bands.

#### Section II – Control of interference to geostationary-satellite systems

ADD USA/1.6/10

**22.5L** A non-geostationary-satellite system in the fixed-satellite service in the frequency bands 37.5-39.5, 39.5-42.5, 47.2-50.2, and 50.4-51.4 GHz shall not exceed a single-entry permissible allowance of 3% of time allowance for degradation in terms of C/N specified in the short term and long term performance objectives of reference GSO FSS networks. The calculation procedures given in Recommendation ITU-R S.[50/40 GHz FSS sharing] and the GSO reference links contained in Recommendation ITU-R S.[50/40 GHz Reference Links] shall be used for the calculation . (WRC-19)

**Reasons:** Based on ITU-R studies, the detailed technical regulatory provisions presented above will introduce technical regulatory provisions into the Radio Regulations that will enable the introduction of non-GSO satellite systems that will protect GSO systems and provide for maximum spectral efficiency for FSS operations in the 50/40 GHz bands.

RESOLUTION 750 (REV.WRC-15)

**Compatibility between the Earth exploration-satellite service (passive)  
and relevant active services**

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

*considering*

- a) that primary allocations have been made to various space services such as the fixed-satellite service (Earth-to-space), the space operation service (Earth-to-space) and the inter-satellite service and/or to terrestrial services such as the fixed service, the mobile service and the radiolocation service, hereinafter referred to as “active services”, in frequency bands adjacent or nearby to frequency bands allocated to the Earth exploration-satellite service (EESS) (passive) subject to No. **5.340**;
- b) that unwanted emissions from active services have the potential to cause unacceptable interference to EESS (passive) sensors;
- c) that, for technical or operational reasons, the general limits in Appendix **3** may be insufficient in protecting the EESS (passive) in specific frequency bands;
- d) that, in many cases, the frequencies used by EESS (passive) sensors are chosen to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems is not possible;
- e) that the frequency band 1 400-1 427 MHz is used for measuring soil moisture, and also for measuring sea-surface salinity and vegetation biomass;
- f) that long-term protection of the EESS in the frequency bands 23.6-24 GHz, 31.3-31.5 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz and 86-92 GHz is vital to weather prediction and disaster management, and measurements at several frequencies must be made simultaneously in order to isolate and retrieve each individual contribution;
- g) that, in many cases, the frequency bands adjacent or nearby to passive service frequency bands are used and will continue to be used for various active service applications;
- h) that it is necessary to ensure equitable burden sharing for achieving compatibility between active and passive services operating in adjacent or nearby frequency bands,

*noting*

- a) that the compatibility studies between relevant active and passive services operating in adjacent and nearby frequency bands are documented in Report ITU-R SM.2092;
- b) that the compatibility studies between IMT systems in the frequency bands 1 375-1 400 MHz and 1 427-1 452 MHz and EESS (passive) systems in the frequency band 1 400-1 427 MHz are documented in Report ITU-R RS.2336;
- c) that Report ITU-R F.2239 provides the results of studies covering various scenarios between the fixed service, operating in the frequency band 81-86 GHz and/or 92-94 GHz, and the Earth exploration-satellite service (passive), operating in the frequency band 86-92 GHz;
- d) that Recommendation ITU-R RS.1029 provides the interference criteria for satellite passive remote sensing,

*noting further*

that, for the purpose of this Resolution:

- point-to-point communication is defined as radiocommunication provided by a link, for example a radio-relay link, between two stations located at specified fixed points;
- point-to-multipoint communication is defined as radiocommunication provided by links between a single station located at a specified fixed point (also called “hub

station”) and a number of stations located at specified fixed points (also called “customer stations”),

*recognizing*

- a) that studies documented in Report ITU-R SM.2092 do not consider point-to-multipoint communication links in the fixed service in the frequency bands 1 350-1 400 MHz and 1 427-1 452 MHz;
- b) that, in the frequency band 1 427-1 452 MHz, mitigation measures, such as channel arrangements, improved filters and/or guardbands, may be necessary in order to meet the limits of unwanted emission for IMT stations in the mobile service specified in Table 1-1 of this Resolution;
- c) that, in the frequency band 1 427-1 452 MHz, IMT mobile stations typically perform better than the equipment specifications as stated by relevant standards organizations, which may be taken into account in meeting the limits specified in Table 1-1 (see also sections 4 and 5 of Report ITU-R RS.2336),

*resolves*

- 1 that unwanted emissions of stations brought into use in the frequency bands and services listed in Table 1-1 below shall not exceed the corresponding limits in that table, subject to the specified conditions;
- 2 to urge administrations to take all reasonable steps to ensure that unwanted emissions of active service stations in the frequency bands and services listed in Table 1-2 below do not exceed the recommended maximum levels contained in that table, noting that EESS (passive) sensors provide worldwide measurements that benefit all countries, even if these sensors are not operated by their country;
- 3 that the Radiocommunication Bureau shall not make any examination or finding with respect to compliance with this Resolution under either Article 9 or 11.

TABLE 1-1

EESS (passive) band	Active service band	Active service	Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band <sup>1</sup>
1 400-1 427 MHz	1 427-1 452 MHz	Mobile	–72 dBW in the 27 MHz of the EESS (passive) band for IMT base stations –62 dBW in the 27 MHz of the EESS (passive) band for IMT mobile stations <sup>2, 3</sup>
23.6-24.0 GHz	22.55-23.55 GHz	Inter-satellite	–36 dBW in any 200 MHz of the EESS (passive) band for non-geostationary (non-GSO) inter-satellite service (ISS) systems for which complete advance publication information is received by the Bureau before 1 January 2020, and –46 dBW in any 200 MHz of the EESS (passive) band for non-GSO ISS systems for which complete advance publication information is received by the Bureau on or after 1 January 2020
31.3-31.5 GHz	31-31.3 GHz	Fixed (excluding HAPS)	For stations brought into use after 1 January 2012: –38 dBW in any 100 MHz of the EESS (passive) band. This limit does not apply to stations that have been authorized prior to 1 January 2012
50.2-50.4 GHz	49.7-50.2 GHz	Fixed-satellite (E-to-s) <sup>4</sup>	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: –10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi –20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi

50.2-50.4 GHz	49.7-50.2 GHz	Fixed-satellite non-GSO (E-to-s) <sup>4</sup>	For stations brought into use after the date of entry into force of the Final Acts of WRC-19: -58 dBW into the 200 MHz of the EESS (passive) band
50.2-50.4 GHz	49.7-50.2 GHz	Fixed-satellite GSO (E-to-s) <sup>4</sup>	For stations brought into use after 1 January 2021: -28 dBW in any 200 MHz of the EESS (passive) band for earth stations with antenna elevation angles lower than 70° -70 dBW in any 200 MHz of the EESS (passive) band for earth stations with antenna elevation angles equal or higher than 70°
50.2-50.4 GHz	50.4-50.9 GHz	Fixed-satellite (E-to-s) <sup>4</sup>	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: -10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi -20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi
50.2-50.4 GHz	50.4-50.9 GHz	Fixed-satellite non-GSO (E-to-s) <sup>4</sup>	For stations brought into use after the date of entry into force of the Final Acts of WRC-19: -58 dBW into the 200 MHz of the EESS (passive) band
50.2-50.4 GHz	50.4-50.9 GHz	Fixed-satellite GSO (E-to-s) <sup>4</sup>	For stations brought into use after 1 January 2021: -28 dBW in any 200 MHz of the EESS (passive) band for earth stations with antenna elevation angles lower than 70° -70 dBW in any 200 MHz of the EESS (passive) band for earth stations with antenna elevation angles equal or higher than 70°
52.6-54.25 GHz	51.4-52.6 GHz	Fixed	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: -33 dBW in any 100 MHz of the EESS (passive) band

<sup>1</sup> The unwanted emission power level is to be understood here as the level measured at the antenna port.

<sup>2</sup> This limit does not apply to mobile stations in the IMT systems for which the notification information has been received by the Radiocommunication Bureau by 28 November 2015. For those systems, -60 dBW/27 MHz applies as the recommended value.

<sup>3</sup> The unwanted emission power level is to be understood here as the level measured with the mobile station transmitting at an average output power of 15 dBm.

<sup>4</sup> The limits apply under clear-sky conditions. During fading conditions, the limits may be exceeded by earth stations when using uplink power control.

**Reasons:** Studies have shown that GSO FSS systems alone cause exceedance the EESS (passive) protection criteria and that in order to allow the aggregate interference from both GSO and NGSO FSS earth stations emission to meet this criteria modifications to the unwanted emission limits for both GSO and NGSO FSS systems are needed.

DRAFT NEW RESOLUTION [USA-A16]

**Protection of geostationary satellite networks from the aggregate equivalent power flux-density produced by non-geostationary satellite networks and systems in the 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz frequency bands**

The World Radiocommunication Conference (2019),

*considering*

- a) that the frequency bands 37.5-39.5, 39.5-42.5, 47.2-50.2 (Earth-to-space), and 50.4-51.4 GHz are allocated, *inter alia*, on a primary basis to the fixed-satellite service (FSS) in all Regions;
- b) that Article 22 contains regulatory and technical provisions on sharing between GSO and non-GSO FSS systems in these bands in *considering a*);
- c) that, in accordance with No. 22.2, non-GSO systems shall not cause unacceptable interference to GSO FSS and broadcasting-satellite service (BSS) networks and, unless otherwise specified in the Radio Regulations, shall not claim protection from GSO FSS and BSS satellite networks;
- d) that non-GSO FSS systems would benefit from the certainty that would result from the quantification of regulatory measures required to protect GSO FSS and BSS satellite networks under No. 22.2;
- e) that the Radio Regulations should enable the introduction of new applications of radiocommunication technology to ensure the operation of as many systems as possible in order to ensure efficient use of spectrum;
- f) that GSO FSS systems can be protected without placing undue constraints on non-GSO FSS systems in the bands in *considering a*);
- g) that single-entry and aggregate limits for the protection of GSO networks from non-geostationary FSS satellite systems are contained in Recommendation ITU-R S.[50/40 GHz sharing];
- h) that this conference modified Article 22 to include single-entry and aggregate permissible time allowances for degradation in terms of C/N of GSO FSS networks in the bands in *considering a*);
- i) that, the aggregate efd levels from multiple non-geostationary FSS systems will be directly related to the actual number of systems sharing a frequency band based on the single-entry operational use of each system;
- j) that the aggregate interference caused by all co-frequency non-GSO FSS systems into these bands into GSO FSS systems should not exceed the aggregate limits given in Recommendation ITU-R S.[50/40 GHz FSS Sharing Methodology] *recommends 3*;

*recognizing*

that non-geostationary FSS systems are likely to need to implement interference mitigation techniques, such as orbital avoidance angles, Earth station site diversity, and GSO arc avoidance, to mutually share frequencies and to protect GSO FSS networks;

*noting*

- a) that Recommendation ITU-R S.[50/40 GHz FSS sharing] contains the methodology for determining conformity to the single-entry and aggregate limits to protect the GSO networks;
- b) that Recommendation ITU-R S.1503 provides recommendations on how to compute the EPFD from a non-GSO system into victim earth stations and satellites;
- c) that administrations may use their own software in conjunction with any approved ITU-R software tools for the calculation and verification of the aggregate limits given in Recommendation ITU-R S.[50/40 GHz sharing], noting that the aggregation of all

systems can be performed from these results without a specialized software tool. They are invited to provide the Radiocommunication Bureau and all participants to the Consultation meetings with access to their software;

- d) that Recommendation ITU-R S.[50/40 GHz FSS Reference Links] contains GSO satellite system characteristics to be considered in frequency sharing analyses within the fixed-satellite service in the frequency bands 37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz;

*resolves*

1 that administrations operating or planning to operate non-geostationary FSS systems in the frequency bands referred to in *considering a)* above, shall, in collaboration, take all necessary steps, including, if necessary, by means of appropriate modifications to their systems or networks, to ensure that the aggregate interference into geostationary FSS and BSS satellite networks caused by such systems operating co-frequency in these frequency bands does not exceed the aggregate protection limits as determined pursuant to No. **22.5M** of the Radio Regulations;

2 that to carry the obligations in *resolves 1* above, administrations operating or planning to operate non-geostationary FSS systems shall agree cooperatively through regular consultation discussions to ensure that operations of all non-GSO networks do not exceed the aggregate level of protection for geostationary satellite networks;

4 that to carry out the calculation of *resolves 2*, administrations shall take into account the GSO satellite characteristics listed in Recommendation ITU-R S.[50/40 GHz Reference Links] when applying the methodology contained in Recommendation ITU-R S.[50/40 GHz sharing methodology] and the epdf results calculated by a epdf validation software;

5 that administrations, in carrying out their obligations under *resolves 1*, shall take into account only those non-geostationary FSS systems with frequency assignments in the frequency bands referred to in *considering a)* above that have met the criteria listed in Annex 2 to this Resolution through appropriate information provided to consultation discussions referred to in *resolves 2*;

6 that administrations, in developing agreements to carry out their obligations under *resolves 1*, shall establish mechanisms to ensure that all potential FSS system and network notifying administrations and operators are given full visibility of and the opportunity to participate in the process;

7 that in the absence of an agreement reached at consultation discussions referred to in *resolves 2*, each non-geostationary FSS system shall be operated in accordance with single-entry limits calculated by the apportionment of the aggregate levels commensurate to the number of non-GSO systems operating so as to assure equitable sharing of the aggregate limit among all non-GSO systems in operation;

8 that the administrations participating at the consultation discussion referred to in *resolves 2* shall designate one convener to be responsible for communicating to the Bureau, such as shown in Annex 1 that the results of the aggregate non-GSO system operational calculation and sharing determinations made in application of *resolves 1* above, without regard to whether such determinations result in any modifications to the published characteristics of their respective systems, providing a draft record of each Consultation meeting, and posting the approved record;

*instructs the Radiocommunication Bureau*

1 to observe the results of the aggregate epdf calculation performed according to *resolves 1*;

2 to publish in the International Frequency Information Circular (BR IFIC), the information referred to in *resolves 8*,

## ANNEX 1 TO RESOLUTION [AGG\_SHARING] (WRC-19)

### **List of GSO FSS system characteristics and format of the result of the aggregate calculation to be provided to BR for publication for information**

□

# **I GSO FSS, GSO BSS and Non-GSO system characteristics to be used in the calculation of aggregate emissions from non-GSO FSS systems**

## **I-1 GSO FSS and GSO BSS Characteristics**

Recommendation ITU-R S.[Ref links]

## **I-2 Non-GSO satellite system constellation parameters**

For each non-GSO satellite system, the following parameters should be provided to BR for publication in the aggregate calculation:

- System administration;
- Number of space stations used in aggregate calculation;
- Single entry use of each non-GSO FSS systems.

2. Results of the aggregate epfd calculation

## **ANNEX 2 TO RESOLUTION [AGG\_EPFD] (WRC-19)**

### **List of criteria for the application of *resolves* 3**

- 1 Submission of appropriate Notification Publication Information.
- 2 Entry into satellite manufacturing or procurement agreement, and entry into satellite launch agreement.

The non-geostationary FSS system operator should possess:

- i) clear evidence of a binding agreement for the manufacture or procurement of its satellites;  
and
- ii) clear evidence of a binding agreement to launch its satellites.

The manufacturing or procurement agreement should identify the contract milestones leading to the completion of manufacture or procurement of satellites required for the service provision, and the launch agreement should identify the launch date, launch site and launch service provider. The notifying administration is responsible for authenticating the evidence of agreement.

The information required under this criterion may be submitted in the form of a written commitment by the responsible administration.

- 3 As an alternative to satellite manufacturing or procurement and launch agreements, clear evidence of guaranteed funding arrangements for the implementation of the project would be accepted. The notifying administration is responsible for authenticating the evidence of these arrangements and for providing such evidence to other interested administrations in furtherance of its obligations under this Resolution.

**Reasons:** To provide a methodology to ensure that aggregate GSO protection levels are never exceeded and to provide a mechanism to monitor the aggregate epfd limits from the operation of actual non-GSO systems.



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## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.13

1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;

**Background:**

Resolution **238 (WRC-15)** calls for studies to determine the spectrum needs for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, as well as sharing and compatibility studies, taking into account the protection of services to which the frequency band is allocated on a primary basis, for the frequency bands:

- 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

It is important to note that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems, including multiple-input and multiple-output (MIMO) and beam-forming techniques in supporting enhanced mobile broadband.

The frequency range 24.25-27.5 GHz, or parts thereof, is allocated to the EESS, FS, FSS, ISS, MS, RLSS, RNS and SRS. The frequency bands adjacent to this frequency range are allocated to the EESS (passive), RAS, RLS and SRS (passive). The details of these allocations and those of the adjacent frequency bands can be found in RR Article 5.

**Proposal:**

Provide a mobile allocation in the 24.25-25.5 GHz frequency range and also provide associated footnotes to the mobile service in order to identify the bands for IMT.

# ARTICLE 5

## Frequency allocations

### Section IV – Table of Frequency Allocations (See No. 2.1)

MOD USA/4821A13/1

#### 22-24.75 GHz

Allocation to services		
Region 1	Region 2	Region 3
<p><b>24.25-24.45</b> FIXED MOBILE except aeronautical mobile ADD 5.A113 MOD 5.338A</p>	<p><b>24.25-24.45</b> MOBILE except aeronautical mobile ADD 5.A113 MOD 5.338A RADIONAVIGATION</p>	<p><b>24.25-24.45</b> RADIONAVIGATION FIXED MOBILE</p>
<p><b>24.45-24.65</b> FIXED INTER-SATELLITE MOBILE except aeronautical mobile ADD 5.A113 MOD 5.338A</p>	<p><b>24.45-24.65</b> INTER-SATELLITE MOBILE except aeronautical mobile ADD 5.A113 MOD 5.338A RADIONAVIGATION 5.533</p>	<p><b>24.45-24.65</b> FIXED INTER-SATELLITE MOBILE ADD 5.A113 MOD 5.338A RADIONAVIGATION 5.533</p>
<p><b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE except aeronautical mobile ADD 5.A113 MOD 5.338A</p>	<p><b>24.65-24.75</b> INTER-SATELLITE MOBILE except aeronautical mobile ADD 5.A113 MOD 5.338A RADIOLOCATION-SATELLITE (Earth-to-space)</p>	<p><b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE ADD 5.A113 MOD 5.338A 5.533</p>

**Reasons:** To provide the allocations and associated footnotes to the mobile service in order to identify the bands for IMT.

MOD USA/4821A13/2

#### 24.75-29.9 GHz

Allocation to services		
Region 1	Region 2	Region 3
<p><b>24.75-25.25</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B MOBILE except aeronautical mobile ADD 5.A113 MOD 5.338A</p>	<p><b>24.75-25.25</b> FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE except aeronautical mobile ADD 5.A113 MOD 5.338A</p>	<p><b>24.75-25.25</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE ADD 5.A113 MOD 5.338A</p>

<b>25.25-25.5</b>	FIXED INTER-SATELLITE 5.536 MOBILE ADD 5.A113 MOD 5.338A Standard frequency and time signal-satellite (Earth-to-space)		
<b>25.5-27</b>	EARTH EXPLORATION-SATELLITE (space-to Earth) 5.536B FIXED INTER-SATELLITE 5.536 MOBILE ADD 5.A113 MOD 5.338A SPACE RESEARCH (space-to-Earth) 5.536C Standard frequency and time signal-satellite (Earth-to-space) 5.536A		
<b>27-27.5</b> FIXED INTER-SATELLITE 5.536 MOBILE ADD 5.A113 MOD 5.338A	<b>27-27.5</b> FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE ADD 5.A113 MOD 5.338A		
5.540 5.542	5.525 5.526 5.527 5.529 5.540		5.540 5.542

**Reasons:** To provide the allocations and associated footnotes to the mobile service in order to identify the bands for IMT.

ADD USA/4821A13/3

**5.A113** The frequency band 24.25-27.5 GHz is identified for use by administrations wishing to implement the terrestrial component of International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. The use of this frequency band by the mobile service for IMT is limited to the land mobile service. Resolutions [A113-IMT ABOVE 24 GHZ] (WRC-19) and 750 (Rev. WRC-19) apply.

**Reasons:** To identify the bands for IMT and to identify the Resolutions which define the operational constraints required to ensure compatibility.

#### Section IV – Table of Frequency Allocations (See No. 2.1)

MOD USA/4821A13/4

**5.338A** In the frequency bands 1 350-1 400 MHz, 1 427-1 452 MHz, 22.55-23.55 GHz, 24.25-27.5 GHz, 30-31.3 GHz, 49.7-50.2 GHz, 50.4-50.9 GHz, 51.4-52.6 GHz, 81-86 GHz and 92-94 GHz, Resolution **750 (Rev.WRC-19)** applies. (WRC-19)

**Reasons:** Consequential.

MOD

**5.536A** Administrations operating earth stations in the Earth exploration-satellite service or the space research service shall not claim protection from stations (except IMT base stations and user terminals) in the fixed and mobile services operated by other administrations. In addition, earth stations in the Earth exploration-satellite service or in the space research service should be operated taking into account the most recent version of Recommendation ITU-R SA.1862. (WRC-19)

**Reasons:** Consequential

MOD

**5.536B** In Saudi Arabia, Austria, Bahrain, Belgium, Brazil, China, Korea (Rep. of), Denmark, Egypt, United Arab Emirates, Estonia, Finland, Hungary, India, Iran (Islamic Republic of), Ireland, Israel, Italy, Jordan, Kenya, Kuwait, Lebanon, Libya, Lithuania, Moldova, Norway, Oman, Uganda, Pakistan, the Philippines, Poland, Portugal, the Syrian Arab Republic, Dem. People's Rep. of Korea, Slovakia, the Czech Rep., Romania, the United Kingdom, Singapore, Sweden, Tanzania, Turkey, Viet Nam and Zimbabwe, earth stations operating in the Earth exploration-satellite service in the frequency band 25.5-27 GHz shall not claim protection from, or constrain the use and deployment of, stations (except IMT base stations and user terminals) of the fixed and mobile services. (WRC-19)

**Reasons:** Consequential

ADD USA/4821A13/5

## DRAFT NEW RESOLUTION [USA-A113-IMT ABOVE 24 GHZ]

### **International Mobile Telecommunications in frequency bands above 24 GHz**

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

*considering*

- a) that IMT encompasses IMT-2000, IMT-Advanced, and IMT-2020 collectively, as described in Resolution ITU-R 56;
- b) that harmonized worldwide bands for IMT are desirable in order to achieve global roaming and the benefits of economies of scale;
- c) that ultra-low latency and very high bit rate applications of IMT will require larger contiguous blocks of spectrum than those available in frequency bands that are currently identified for use by administrations wishing to implement IMT;
- d) that all or portions of the bands identified for IMT are already allocated to the fixed, mobile, space research, inter-satellite, fixed-satellite, mobile-satellite and Earth exploration-satellite services on a co-primary basis and are already in use by incumbent services,
- e) that ITU-R has studied, in preparation of WRC-19, sharing and compatibility with services allocated in bands identified for IMT above 24 GHz and in adjacent bands, based on assumed characteristics Recommendation ITU-R M.2101;
- f) that any identification of frequency bands for IMT should take into account the use of the bands by other services and the evolving needs of these services,
- g) that the identification of frequency bands for IMT-2020 requires technical and regulatory measures to ensure compatibility with and future development of incumbent services and applications operating in the identified and adjacent frequency bands,

*noting*

- a) Resolutions **223 (Rev.WRC-15)**, **224 (Rev.WRC-15)** and **225 (Rev.WRC-12)**, which also relate to IMT;
- b) that the identification of a frequency band for IMT does not establish priority in the Radio Regulations and does not preclude the use of the frequency band by any application of the services to which it is allocated,

*recognizing*

- a) that Resolution **750 (Rev.WRC-19)** establishes limits on unwanted emissions in the frequency band 23.6-24 GHz from IMT base stations and IMT mobile stations within the [24.25-27.5 GHz] frequency band;

*resolves*

1 in order to ensure the coexistence between IMT in the frequency band 24.25-27.5 GHz as identified by WRC-19 in Article 5 of the Radio Regulations and other services to which the frequency band is allocated including the protection of these other services, administrations shall apply the conditions as stated below;

1a that the electrical tilt of IMT base station beams shall not be higher than 0 degrees relative to the horizontal and the mechanical tilt of IMT base stations be below the horizon. In addition, IMT base stations shall comply with the TRP limits given in Table 1:

TABLE 1

**TRP\* limits for IMT base stations**

Frequency bands	dB(W/200 MHz)
24.25-27.5 GHz	5/7

\* Total radiated power (TRP) is the sum of all power radiated by an antenna connected to a transmitter. This level applies for all foreseen modes of operation (i.e. maximum in-band power, electrical pointing, carrier configurations).

2 that administrations wishing to implement IMT consider the use of frequency band 24.25-27.5 GHz identified for IMT in **No. 5.A113**, and the benefits of harmonized utilization of the spectrum for the terrestrial component of IMT taking into account the latest relevant ITU-R Recommendations,

*invites administrations*

1 to adopt provisions to protect other services from IMT networks and to ensure the possibility of deploying future SRS/EESS earth stations;

2 to adopt provisions to ensure the possibility of deploying future FSS earth stations,

*invites ITU-R*

1 to develop harmonized frequency arrangements to facilitate IMT deployment in the frequency band 24.25-27.5 GHz, taking into account the results of sharing and compatibility studies;

2 to develop an ITU-R Recommendation to assist administrations in protecting of existing and future SRS/EESS earth stations operating in the frequency band 25.5-27 GHz;

3 to develop an ITU-R Recommendation to assist administrations in ensuring the coexistence between existing and future FSS earth stations and IMT operating within the frequency band 24.25-27.5 GHz;

4 to update existing ITU-R Recommendations or develop a new ITU-R Recommendation, as appropriate, to provide information and assistance to the administrations on possible coordination and protection measures for the radio astronomy service in the frequency band 23.6-24 GHz from the IMT deployment;

**Reasons:** Resolution [A113-IMT ABOVE 24 GHZ] defines the appropriate operations of IMT in the band 25.25-27.5 GHz band.

MOD USA/4821A13/6

## RESOLUTION 750 (REV.WRC-19)

### **Compatibility between the Earth exploration-satellite service (passive) and relevant active services**

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

...

*resolves*

1 that unwanted emissions of stations brought into use in the frequency bands and services listed in Table 1-1 below shall not exceed the corresponding limits in that table, subject to the specified conditions;

...

TABLE 1-1

EESS (passive) band	Active service band	Active service	Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band <sup>1</sup>
23.6-24.0 GHz	22.55-23.55 GHz	Inter-satellite	-36 dBW in any 200 MHz of the EESS (passive) band for non-geostationary (non-GSO) inter-satellite service (ISS) systems for which complete advance publication information is received by the Bureau before 1 January 2020, and -46 dBW in any 200 MHz of the EESS (passive) band for non-GSO ISS systems for which complete advance publication information is received by the Bureau on or after 1 January 2020
	24.25-27.5	Mobile (see Note 1)	-44.7 dBW/200 MHz for IMT
...	...	...	...

Note 1: The unwanted emission power level is measured using Total Radiated Power (TRP) methodology. TRP is the aggregate of the radiated power from each antenna element.

<sup>1</sup> The unwanted emission power level is to be understood here as the level measured at the antenna port.

**Reasons:** To identify the limits of unwanted emissions from IMT into the 23.6-24 GHz passive band.

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.13

1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;

#### **Background Information:**

Resolution **238 (WRC-15)** calls for studies to determine the spectrum needs for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, as well as sharing and compatibility studies, taking into account the protection of services to which the frequency band is allocated on a primary basis, for the frequency bands:

- 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

It is important to note that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems, including multiple-input and multiple-output (MIMO) and beam-forming techniques in supporting enhanced mobile broadband.

Several compatibility studies between the EESS/SRS (passive) in the frequency band 36-37 GHz and IMT in the frequency band 37-40.5 GHz have been conducted. All of these studies showed that IMT systems will cause exceedance of the EESS (passive) protection criteria, especially if multiple operators are considered.

Compatibility studies between SRS (space-Earth) Earth stations in the frequency band 37-38 GHz have shown that the separation distances around SRS earth station locations would be on the order of 100 km depending on the earth station considered and the surrounding terrain. Per the multinational Space Frequency Coordination Group (SFCG) [Recommendation 14-2R5](#), the international space science agencies collectively have designated the band 37-38 GHz for the implementation of space-to-Earth links for manned and unmanned planetary missions and for development and operation of manned missions in the Lunar environment. It is of critical importance to ensure the protection of these communication links that will be supporting manned missions and safety of life operations. Given the sensitive nature and global (though limited in number) deployment of such SRS earth stations compatibility may not be feasible given the ubiquitous nature of IMT.

#### **Proposal**

Considering the potential impacts to both EESS (passive) in the 36-37 GHz band and the need to ensure the protection of the safety of life operations utilizing the SRS Earth stations in the 37-38 GHz band NOC is proposed for the 37-40.5 GHz frequency band.



# ARTICLE 5

## Frequency allocations

### Section IV – Table of Frequency Allocations (See No. 2.1)

NOC USA/4823A13/1

#### 34.2-40 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>34.2-34.7</b>	RADIOLOCATION SPACE RESEARCH (deep space) (Earth-to-space) 5.549	
<b>34.7-35.2</b>	RADIOLOCATION Space research 5.550 5.549	
<b>35.2-35.5</b>	METEOROLOGICAL AIDS RADIOLOCATION 5.549	
<b>35.5-36</b>	METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.549 5.549A	
<b>36-37</b>	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) 5.149 5.550A	
<b>37-37.5</b>	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) 5.547	
<b>37.5-38</b>	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	
<b>38-39.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth exploration-satellite (space-to-Earth) 5.547	

<b>39.5-40</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547
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**Reasons:** To protect EESS (passive) in the 36-37 GHz band and ensure the protection of the safety of life operations utilizing the SRS Earth stations in the 37-38 GHz band, NOC is proposed for the 37-40.5 GHz frequency band.

NOC USA/4823A13/2

### 40-47.5 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>40-40.5</b>	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)	
<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547
<b>41-42.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I	
<b>42.5-43.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149 5.547	
<b>43.5-47</b>	MOBILE 5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	
<b>47-47.2</b>	AMATEUR AMATEUR-SATELLITE	

47.2-47.5

FIXED  
FIXED-SATELLITE (Earth-to-space) 5.552  
MOBILE  
5.552A

**Reasons:** To protect EESS (passive) in the 36-37 GHz band and ensure the protection of the safety of life operations utilizing the SRS Earth stations in the 37-38 GHz band, NOC is proposed for the 37-40.5 GHz frequency band.

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.13

1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;

#### **Background:**

Resolution **238 (WRC-15)** calls for studies to determine the spectrum needs for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, as well as sharing and compatibility studies, taking into account the protection of services to which the frequency band is allocated on a primary basis, for the frequency bands:

- 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

It is important to note that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems, including multiple-input and multiple-output (MIMO) and beam-forming techniques in supporting enhanced mobile broadband.

Several compatibility studies between the EESS/SRS (passive) in the frequency band 50.2-50.4 GHz and IMT in the frequency band 47.2-50.2 GHz have been conducted. All of these studies showed that IMT systems will cause exceedance of the EESS (passive) protection criteria, especially if IMT deployments by multiple operators are considered.

Data from EESS (passive) systems in this band plays a major role in many public safety activities such as:

- identifying areas at risk for natural disasters;
- forecasting weather and predicting climate change;
- detecting and tracking tsunamis, hurricanes, tornadoes, oil leaks, etc.;
- providing alerting/warning information of such disasters;
- assessing the damage caused by such disasters;
- providing information for planning relief operations; and
- monitoring recovery from a disaster.

This band is also being utilized by the Fixed Satellite Service for the deployment of both gateways and user terminals with potentially high density applications further increasing the interference potential to the EESS (passive). Additionally, studies have shown that sharing is not feasible between FSS user terminals with undetermined locations and ubiquitous IMT.

#### **Proposal:**

Considering the potential impacts to EESS (passive) and the infeasibility of sharing between FSS user terminals and IMT, NOC is proposed for the 47.2-50.2 GHz frequency band.

# ARTICLE 5

## Frequency allocations

### Section IV – Table of Frequency Allocations (See No. 2.1)

NOC USA/4826A13/1

#### 40-47.5 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>40-40.5</b>	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)	
<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	<b>40.5-41</b> FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547
<b>41-42.5</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I	
<b>42.5-43.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149 5.547	
<b>43.5-47</b>	MOBILE 5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	
<b>47-47.2</b>	AMATEUR AMATEUR-SATELLITE	

<b>47.2-47.5</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A
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**Reasons:** To protect EESS (passive) in the 50.2-50.4 GHz band and due to infeasibility of sharing between FSS user terminals and IMT, NOC is proposed for the 47.2-50.2 GHz frequency band.

NOC USA/4826A13/2

**47.5-51.4 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>47.5-47.9</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 (space-to-Earth) 5.516B 5.554A MOBILE	<b>47.5-47.9</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE	
<b>47.9-48.2</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A	
<b>48.2-48.54</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	<b>48.2-50.2</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.338A 5.552 MOBILE	
<b>48.54-49.44</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.149 5.340 5.555	5.149 5.340 5.555	
<b>49.44-50.2</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.338A 5.552 (space-to-Earth) 5.516B 5.554A 5.555B MOBILE		
<b>50.2-50.4</b>	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340	
<b>50.4-51.4</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE Mobile-satellite (Earth-to-space)	

**Reasons:** To protect EESS (passive) in the 50.2-50.4 GHz band and due to infeasibility of sharing between FSS user terminals and IMT, NOC is proposed for the 47.2-50.2 GHz frequency band.



## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.13

1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;

#### **Background:**

Resolution **238 (WRC-15)** calls for studies to determine the spectrum needs for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, as well as sharing and compatibility studies, taking into account the protection of services to which the frequency band is allocated on a primary basis, for the frequency bands:

- 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

It is important to note that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems, including multiple-input and multiple-output (MIMO) and beam-forming techniques in supporting enhanced mobile broadband.

Several compatibility studies between the EESS/SRS (passive) in the frequency band 50.2-50.4 GHz and IMT in the frequency band 47.2-50.2 GHz have been conducted. All of these studies showed that IMT systems will cause exceedance of the EESS (passive) protection criteria, especially if IMT deployments by multiple operators are considered.

Data from EESS (passive) systems in this band plays a major role in many public safety activities such as:

- identifying areas at risk for natural disasters;
- forecasting weather and predicting climate change;
- detecting and tracking tsunamis, hurricanes, tornadoes, oil leaks, etc.;
- providing alerting/warning information of such disasters;
- assessing the damage caused by such disasters;
- providing information for planning relief operations; and
- monitoring recovery from a disaster.

This band is also being utilized by the Fixed Satellite Service for the deployment of both gateways and user terminals with potentially high density applications further increasing the interference potential to the EESS (passive). Additionally, studies have shown the sharing is not feasible between FSS user terminals with undetermined locations and ubiquitous IMT.

#### **Proposal:**

Considering the potential impacts to EESS (passive) and the infeasibility of sharing between FSS user terminals and IMT, NOC is proposed for the 50.4-52.6 GHz frequency band.





<b>50.4-51.4</b>	FIXED FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE Mobile-satellite (Earth-to-space)
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**Reasons:** To protect EESS (passive) in the 50.2-50.4 GHz band and due to infeasibility of sharing between FSS user terminals and IMT, NOC is proposed for the 50.4-52.6 GHz frequency band.

NOC USA/4827A13/2

**51.4-55.78 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>51.4-52.6</b>	FIXED 5.338A MOBILE 5.547 5.556	
<b>52.6-54.25</b>	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 5.556	
<b>54.25-55.78</b>	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.556A SPACE RESEARCH (passive) 5.556B	

**Reasons:** To protect EESS (passive) in the 50.2-50.4 GHz band and due to infeasibility of sharing between FSS user terminals and IMT, NOC is proposed for the 50.4-52.6 GHz frequency band.

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.13

1.13 to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **238 (WRC-15)**;

#### **Background:**

Resolution **238 (WRC-15)** calls for studies to determine the spectrum needs for the terrestrial component of IMT in the frequency range between 24.25 GHz and 86 GHz, as well as sharing and compatibility studies, taking into account the protection of services to which the frequency band is allocated on a primary basis, for the frequency bands:

- 24.25-27.5 GHz, 37-40.5 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 66-76 GHz and 81-86 GHz, which have allocations to the mobile service on a primary basis; and
- 31.8-33.4 GHz, 40.5-42.5 GHz and 47-47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

It is important to note that the properties of higher frequency bands, such as shorter wavelength, would better enable the use of advanced antenna systems, including multiple-input and multiple-output (MIMO) and beam-forming techniques in supporting enhanced mobile broadband.

Several compatibility studies between the EESS/SRS (passive) in the frequency band 86-92 GHz and IMT in the frequency band 81-86 GHz have been conducted. All of these studies showed that IMT systems will cause exceedance of the EESS (passive) protection criteria, based on the parameters given. However, compatibility may be possible if appropriate limits for this band are placed in Resolution 750.

#### **Proposals:**

Considering the potential impacts to both EESS (passive) in the 86-92 GHz this contribution proposes to create an identification for IMT within the existing mobile allocation of 81-86 GHz subject specific conditions. The specific condition is out of band emission limits that are proposed to be contained in Resolution **750 (WRC-19)** Table 1-1.

## ARTICLE 5

### Frequency allocations

#### Section IV – Table of Frequency Allocations (See No. 2.1)

MOD USA/4828A13/1

#### 81-86 GHz

Allocation to services		
Region 1	Region 2	Region 3
81-84	FIXED 5.338A FIXED-SATELLITE (Earth-to-space) MOBILE ADD 5.A113 MOD 5.338A MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) 5.149 5.561A	
84-86	FIXED 5.338A FIXED-SATELLITE (Earth-to-space) 5.561B MOBILE ADD 5.A113 MOD 5.338A RADIO ASTRONOMY 5.149	

**Reasons:** To identify the existing mobile allocation in the 81-86 GHz frequency band for use by IMT.

ADD USA/4821A13/2

**5.A113** The frequency band 81-86 GHz is identified for use by administrations wishing to implement International Mobile Telecommunications (IMT). This identification does not preclude the use of this frequency band by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. Resolutions [A113-IMT ABOVE 24 GHZ] (WRC-19) and 750 (Rev. WRC-19) apply.

**Reasons:** To identify the bands for IMT and to identify the Resolutions which define the operational constraints required to ensure compatibility.

#### Section IV – Table of Frequency Allocations (See No. 2.1)

MOD USA/4821A13/3

**5.338A** In the frequency bands 1 350-1 400 MHz, 1 427-1 452 MHz, 22.55-23.55 GHz, 30-31.3 GHz, 49.7-50.2 GHz, 50.4-50.9 GHz, 51.4-52.6 GHz, 81-86 GHz and 92-94 GHz, Resolution 750 (Rev.WRC-19) applies. (WRC-19)

**Reasons:** Consequential.

RESOLUTION 750 (REV.WRC-15)

**Compatibility between the Earth exploration-satellite service (passive)  
and relevant active services**

The World Radiocommunication Conference (Geneva, 2015),

*considering*

- a) that primary allocations have been made to various space services such as the fixed-satellite service (Earth-to-space), the space operation service (Earth-to-space) and the inter-satellite service and/or to terrestrial services such as the fixed service, the mobile service and the radiolocation service, hereinafter referred to as “active services”, in frequency bands adjacent or nearby to frequency bands allocated to the Earth exploration-satellite service (EESS) (passive) subject to No. **5.340**;
- b) that unwanted emissions from active services have the potential to cause unacceptable interference to EESS (passive) sensors;
- c) that, for technical or operational reasons, the general limits in Appendix 3 may be insufficient in protecting the EESS (passive) in specific frequency bands;
- d) that, in many cases, the frequencies used by EESS (passive) sensors are chosen to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems is not possible;
- e) that the frequency band 1 400-1 427 MHz is used for measuring soil moisture, and also for measuring sea-surface salinity and vegetation biomass;
- f) that long-term protection of the EESS in the frequency bands 23.6-24 GHz, 31.3-31.5 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz and 86-92 GHz is vital to weather prediction and disaster management, and measurements at several frequencies must be made simultaneously in order to isolate and retrieve each individual contribution;
- g) that, in many cases, the frequency bands adjacent or nearby to passive service frequency bands are used and will continue to be used for various active service applications;
- h) that it is necessary to ensure equitable burden sharing for achieving compatibility between active and passive services operating in adjacent or nearby frequency bands,

*noting*

- a) that the compatibility studies between relevant active and passive services operating in adjacent and nearby frequency bands are documented in Report ITU-R SM.2092;
- b) that the compatibility studies between IMT systems in the frequency bands 1 375-1 400 MHz and 1 427-1 452 MHz and EESS (passive) systems in the frequency band 1 400-1 427 MHz are documented in Report ITU-R RS.2336;
- c) that Report ITU-R F.2239 provides the results of studies covering various scenarios between the fixed service, operating in the frequency band 81-86 GHz and/or 92-94 GHz, and the Earth exploration-satellite service (passive), operating in the frequency band 86-92 GHz;
- d) that Recommendation ITU-R RS.1029 provides the interference criteria for satellite passive remote sensing,

*noting further*

that, for the purpose of this Resolution:

point-to-point communication is defined as radiocommunication provided by a link, for example a radio-relay link, between two stations located at specified fixed points;

point-to-multipoint communication is defined as radiocommunication provided by links between a single station located at a specified fixed point (also called “hub station”) and a number of stations located at specified fixed points (also called “customer stations”),

*recognizing*

- a) that studies documented in Report ITU-R SM.2092 do not consider point-to-multipoint communication links in the fixed service in the frequency bands 1 350-1 400 MHz and 1 427-1 452 MHz;
- b) that, in the frequency band 1 427-1 452 MHz, mitigation measures, such as channel arrangements, improved filters and/or guardbands, may be necessary in order to meet the limits of unwanted emission for IMT stations in the mobile service specified in Table 1-1 of this Resolution;
- c) that, in the frequency band 1 427-1 452 MHz, IMT mobile stations typically perform better than the equipment specifications as stated by relevant standards organizations, which may be taken into account in meeting the limits specified in Table 1-1 (see also sections 4 and 5 of Report ITU-R RS.2336),

*resolves*

- 1 that unwanted emissions of stations brought into use in the frequency bands and services listed in Table 1-1 below shall not exceed the corresponding limits in that table, subject to the specified conditions;
- 2 to urge administrations to take all reasonable steps to ensure that unwanted emissions of active service stations in the frequency bands and services listed in Table 1-2 below do not exceed the recommended maximum levels contained in that table, noting that EESS (passive) sensors provide worldwide measurements that benefit all countries, even if these sensors are not operated by their country;
- 3 that the Radiocommunication Bureau shall not make any examination or finding with respect to compliance with this Resolution under either Article 9 or 11.

TABLE 1-1

EESS (passive) band	Active service band	Active service	Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band <sup>1</sup>
1 400-1 427 MHz	1 427-1 452 MHz	Mobile	–72 dBW in the 27 MHz of the EESS (passive) band for IMT base stations –62 dBW in the 27 MHz of the EESS (passive) band for IMT mobile stations <sup>2, 3</sup>
23.6-24.0 GHz	22.55-23.55 GHz	Inter-satellite	–36 dBW in any 200 MHz of the EESS (passive) band for non-geostationary (non-GSO) inter-satellite service (ISS) systems for which complete advance publication information is received by the Bureau before 1 January 2020, and –46 dBW in any 200 MHz of the EESS (passive) band for non-GSO ISS systems for which complete advance publication information is received by the Bureau on or after 1 January 2020
31.3-31.5 GHz	31-31.3 GHz	Fixed (excluding HAPS)	For stations brought into use after 1 January 2012: –38 dBW in any 100 MHz of the EESS (passive) band. This limit does not apply to stations that have been authorized prior to 1 January 2012
50.2-50.4 GHz	49.7-50.2 GHz	Fixed-satellite (E-to-s) <sup>4</sup>	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: –10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi –20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi

50.2-50.4 GHz	50.4-50.9 GHz	Fixed-satellite (E-to-s) <sup>4</sup>	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: –10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi –20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi
52.6-54.25 GHz	51.4-52.6 GHz	Fixed	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: –33 dBW in any 100 MHz of the EESS (passive) band
86 – 92 GHz	81 – 86 GHz	Mobile (see Note 1)	–42.6 dBW/200 MHz for IMT-2020

Note 1: The unwanted emission power level is measured using Total Radiated Power (TRP) methodology. TRP is the aggregate of the radiated power from each antenna element.

<sup>1</sup> The unwanted emission power level is to be understood here as the level measured at the antenna port.

<sup>2</sup> This limit does not apply to mobile stations in the IMT systems for which the notification information has been received by the Radiocommunication Bureau by 28 November 2015. For those systems, –60 dBW/27 MHz applies as the recommended value.

<sup>3</sup> The unwanted emission power level is to be understood here as the level measured with the mobile station transmitting at an average output power of 15 dBm.

<sup>4</sup> The limits apply under clear-sky conditions. During fading conditions, the limits may be exceeded by earth stations when using uplink power control.

**Reasons:** To protect the incumbent primary allocated EESS (passive) in the adjacent band. IMT and the incumbent EESS (passive) are not compatible without this modification.

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 1.14

1.14 to consider, on the basis of ITU-R studies in accordance with Resolution **160 (WRC-15)**, appropriate regulatory actions for high-altitude platform stations (HAPS), within existing fixed-service allocations;

#### **Background:**

Article 1.66A of the ITU Radio Regulations defines a high-altitude platform station (HAPS) as "a station on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth". Agenda Item 1.14 was adopted by WRC-15 to consider, in accordance with Resolution 160 (WRC-15), regulatory actions that can facilitate deployment of HAPS for broadband delivery. Resolution 160 resolves to invite ITU-R to study additional spectrum needs of HAPS, examining the suitability of existing HAPS identifications and conducting sharing and compatibility studies for additional identifications in existing fixed allocations in the 38-39.5 GHz band on a global basis and in 21.4-22 GHz and 24.25-27.5 GHz bands in Region 2 exclusively.

Currently there are 3 spectrum bands identified for HAPS in the fixed service. These are:

- 47.2–47.5 GHz and 47.9–48.2 GHz,
- 27.9–28.2 GHz and 31.0–31.3 GHz,
- 6 440–6 520 MHz (HAPS-ground) and 6 560–6 640 MHz (ground-HAPS).

Some administrations contended that the spectrum needs of next-generation HAPS cannot be accommodated within these identifications due to either geographical restrictions or technical limitations which impairs their operation. ITU-R Working Party 5C developed a Preliminary New Draft Recommendation (PDNR) assessing spectrum needs for broadband HAPS at an approximate 4 GHz aggregate capacity. WP 5C also conducted compatibility studies to assess coexistence between HAPS and incumbent and proposed systems and services (including WRC-19 Agenda Items 1.6 and 1.13). The sharing and compatibility studies have been developed on a band-by-band basis. In general, these studies consider the impact of HAPS uplink (ground-to-HAPS) and/or downlink (HAPS-to-ground) transmissions. In most cases, the studies identify specific methods to ensure the protection of each service. The studies are based on assumptions related to the types of deployment scenarios and technical characteristics of HAPS systems which are described in the draft of a new recommendation on HAPS characteristics as well as the specific text within each sharing study.

The draft CPM text includes three Methods to address Agenda Item 1.14:

**Method A** – No change. The existing provisions in the Radio Regulation remain unchanged in the corresponding frequency band.

**Method B** – Designation of bands, in accordance with Resolution **160 (WRC-15)** with options. This may include, e.g. global or regional designation for HAPS, limitations regarding link directions, and inclusion of the technical conditions of operation of HAPS systems for the protection of other services. This could be achieved by new or revised footnotes to the Table of Frequency Allocations, and new or revised associated WRC Resolutions.

**Method B1** – Revision of the regulatory provisions for HAPS in the fixed service (FS) with a primary status in bands already designated for HAPS.

**Method B2** – Add new designation(s) for HAPS in bands already allocated to the FS with a primary status.

**Method B3** – Add a primary allocation to the FS and a new designation for HAPS in the band 24.25-25.25 GHz (Region 2) not already allocated to the FS.

**Method C** – Suppress the existing HAPS designation, pursuant to resolves 3 of Resolution 160 (WRC-15).



**Proposal:**

Based on the results of studies, NOC is proposed for the 21.4-22 GHz, 24.25-24.75 GHz, and 25.5-27 GHz frequency ranges.

# ARTICLE 5

## Frequency allocations

### Section IV – Table of Frequency Allocations (See No. 2.1)

NOC USA/4809A14/1

#### 18.4-22 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>18.4-18.6</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE	
<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B MOBILE except aeronautical mobile Space research (passive) 5.522A 5.522C	<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B MOBILE except aeronautical mobile SPACE RESEARCH (passive) 5.522A	<b>18.6-18.8</b> EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.522B MOBILE except aeronautical mobile Space research (passive) 5.522A
<b>18.8-19.3</b>	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A MOBILE	
<b>19.3-19.7</b>	FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E MOBILE	
<b>19.7-20.1</b> FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A Mobile-satellite (space-to-Earth)  5.524	<b>19.7-20.1</b> FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528 5.529	<b>19.7-20.1</b> FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A Mobile-satellite (space-to-Earth)  5.524
<b>20.1-20.2</b>	FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528	
<b>20.2-21.2</b>	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth) 5.524	

<b>21.2-21.4</b>	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)	
<b>21.4-22</b> FIXED MOBILE BROADCASTING-SATELLITE 5.208B 5.530A 5.530B 5.530D	<b>21.4-22</b> FIXED MOBILE  5.530A	<b>21.4-22</b> FIXED MOBILE BROADCASTING-SATELLITE 5.208B 5.530A 5.530B 5.530D 5.531

**Reasons:** ITU-R studies have shown that the protection criteria for the mobile service will be exceeded. Therefore a designation for HAPS cannot be made in the 21.4-22 GHz band.

NOC USA/4809A14/2

**22-24.75 GHz**

Allocation to services		
Region 1	Region 2	Region 3
<b>22-22.21</b>	FIXED MOBILE except aeronautical mobile 5.149	
<b>22.21-22.5</b>	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) 5.149 5.532	
<b>22.5-22.55</b>	FIXED MOBILE	
<b>22.55-23.15</b>	FIXED INTER-SATELLITE 5.338A MOBILE SPACE RESEARCH (Earth-to-space) 5.532A 5.149	
<b>23.15-23.55</b>	FIXED INTER-SATELLITE 5.338A MOBILE	
<b>23.55-23.6</b>	FIXED MOBILE	
<b>23.6-24</b>	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	
<b>24-24.05</b>	AMATEUR AMATEUR-SATELLITE 5.150	
<b>24.05-24.25</b>	RADIOLOCATION Amateur Earth exploration-satellite (active) 5.150	

<b>24.25-24.45</b> FIXED	<b>24.25-24.45</b> RADIONAVIGATION	<b>24.25-24.45</b> RADIONAVIGATION FIXED MOBILE
<b>24.45-24.65</b> FIXED INTER-SATELLITE	<b>24.45-24.65</b> INTER-SATELLITE RADIONAVIGATION  5.533	<b>24.45-24.65</b> FIXED INTER-SATELLITE MOBILE RADIONAVIGATION 5.533
<b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE	<b>24.65-24.75</b> INTER-SATELLITE RADIOLOCATION- SATELLITE (Earth-to-space)	<b>24.65-24.75</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE 5.533

**Reasons:** ITU-R studies have shown that out of band emission limits and/or other restrictions are needed to protect the passive services in the band 23.6-24 GHz. Studies have not demonstrated that HAPS systems can meet these protection limits and/or restrictions therefore a designation for HAPS cannot be made in the 24.25-24.75 GHz frequency range.

NOC USA/4809A14/3

### 24.75-29.9 GHz

Allocation to services		
Region 1	Region 2	Region 3
<b>24.75-25.25</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.532B	<b>24.75-25.25</b> FIXED-SATELLITE (Earth-to-space) 5.535	<b>24.75-25.25</b> FIXED FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE
<b>25.25-25.5</b>	FIXED INTER-SATELLITE 5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)	
<b>25.5-27</b>	EARTH EXPLORATION-SATELLITE (space-to Earth) 5.536B FIXED INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH (space-to-Earth) 5.536C Standard frequency and time signal-satellite (Earth-to-space) 5.536A	
<b>27-27.5</b> FIXED INTER-SATELLITE 5.536 MOBILE	<b>27-27.5</b> FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE	

<p><b>27.5-28.5</b></p>	<p>FIXED 5.537A  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539  MOBILE  5.538 5.540</p>	
<p><b>28.5-29.1</b></p>	<p>FIXED  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540</p>	
<p><b>29.1-29.5</b></p>	<p>FIXED  FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A  5.539 5.541A  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540</p>	
<p><b>29.5-29.9</b>  FIXED-SATELLITE  (Earth-to-space) 5.484A 5.484B  5.516B 5.527A 5.539  Earth exploration-satellite  (Earth-to-space) 5.541  Mobile-satellite (Earth-to-space)  5.540 5.542</p>	<p><b>29.5-29.9</b>  FIXED-SATELLITE  (Earth-to-space) 5.484A 5.484B  5.516B 5.527A 5.539  MOBILE-SATELLITE  (Earth-to-space)  Earth exploration-satellite  (Earth-to-space) 5.541  5.525 5.526 5.527 5.529 5.540</p>	<p><b>29.5-29.9</b>  FIXED-SATELLITE  (Earth-to-space) 5.484A 5.484B  5.516B 5.527A 5.539  Earth exploration-satellite  (Earth-to-space) 5.541  Mobile-satellite (Earth-to-space)  5.540 5.542</p>

**Reasons:** ITU-R studies have not demonstrated that HAPS systems can protect EESS/SRS earth stations in the 25.5-27 GHz frequency range, therefore a designation for HAPS cannot be made in this band.

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 4

**Agenda Item 4:** To review the resolutions and recommendations of previous conferences with a view to their possible revision, replacement or abrogation in accordance with Resolution **95 (Rev.WRC-07)**.

**Issue:** To review the resolutions and recommendations in the Radio Regulations and to identify potential modifications or suppressions.

**Background Information:** This is a standing agenda item for every WRC agenda. The purpose of this agenda item is to examine the WRC resolutions and recommendations for editorial corrections as well as suppressions due to completion of work or material superseded by other work. This includes consequential suppression or modification of resolutions associated with WRC-19 agenda items.

Resolution **95 (Rev.WRC-07)** resolves to invite future competent world radiocommunication conferences

1. to review the Resolutions and Recommendations of previous conferences that are related to the agenda of the Conference with a view to their possible revision, replacement or abrogation and to take appropriate action;
2. to review the Resolutions and Recommendations of previous conferences that are not related to any agenda item of the Conference with a view to:
  - abrogating those Resolutions and Recommendations that have served their purpose or have become no longer necessary;
  - reviewing the need for those Resolutions and Recommendations, or parts thereof, requesting ITU-R studies on which no progress has been made during the last two periods between conferences;
  - updating and modifying Resolutions and Recommendations, or parts thereof that have become out of date, and to correct obvious omissions, inconsistencies, ambiguities or editorial errors and effect any necessary alignment;

**Proposal:** Draft positions for review of ITU-R Resolutions and Recommendations in the attachment to identify any modifications or suppression required.



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## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 7

##### Issue A

**Agenda Item 7:** to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary satellite orbit;

**Issue A** – Bringing into use of frequency assignments to all non-GSO satellite systems, and consideration of a milestone-based approach for the deployment of non-GSO satellite systems in specific bands and services

#### **BACKGROUND:**

WRC-12 and WRC-15 adopted into the Radio Regulations a series of specific provisions—including RR No. **11.44B**— that clarified the requirements for the bringing into use (BIU) and the bringing back into use (BBIU) of frequency assignments to a space station in a geostationary (GSO) satellite network. However, there are no provisions in the RR that specifically address the BIU of frequency assignments to space stations in non-GSO satellite systems. In this context and in order to complete the recording of frequency assignments to non-GSO satellite systems, it has been the practice of the Bureau to declare their BIU successfully completed when one satellite is deployed into a notified orbital plane and capable of transmitting and/or receiving those frequency assignments. This practice, reflected for FSS and MSS non-GSO systems in the Rules of Procedure for RR No. **11.44** (*see* Rule of Procedure for RR No. **11.44**, section 2), has been used for a number of years. Furthermore, it has been used irrespective of the number of satellites or of the number of orbital planes indicated in the notification information provided under RR No. **11.2**.

In its report to WRC-15 on the experience in the application of regulatory procedures and other related matters, the Director of the Radiocommunication Bureau stated that:

“Taking into account of the numerous non-GSO systems received so far by the Bureau, and the possible speculative nature of such submissions that could lead to spectrum warehousing and resurgence of so-called “paper satellite networks” the conference may wish to consider redefining the notion of bringing into use for non-GSO satellite networks.”

WRC-15 invited the ITU-R to examine, under the standing WRC agenda item 7, the possible development of regulatory provisions beyond those under RR Nos. **11.25** and **11.44** on the non-GSO FSS/MSS systems and the implications of the application of such milestones to non-GSO FSS/MSS systems brought into use after WRC-15.

The ITU-R studied both the bringing into use of frequency assignments to non-GSO systems, and the possibility of adopting a milestone-based approach for the deployment of non-GSO satellite systems comprised of multiple, multi-satellite constellations in particular frequency bands. The ITU-R studies have led to two general conclusions, one related to the concept of the bringing into use and the other

related to the milestone-based approach for deployment of non-GSO satellite systems, each with multiple options for implementation.

The first general conclusion is that the bringing into use of frequency assignments to non-GSO systems should continue to be achieved by the deployment of one satellite into one of the notified orbital planes within seven years of the date of receipt of the API or request for coordination, as applicable. This conclusion applies for frequency assignments for all non-GSO systems in all bands and services.

The second general conclusion is that a new Resolution should be adopted to implement a milestone-based approach for the deployment of non-GSO systems but only in the specific bands and services listed in the Table of the Resolution. This milestone-based approach would provide an additional period beyond the seven-year regulatory period in No. **11.44** for the deployment of the number of satellites, as notified and/or recorded, with the objective to help ensure that the Master International Frequency Register (MIFR) reasonably reflects actual deployment of such non-GSO systems. The United States does not support applying the milestone-based approach to the science services.

Adoption of the proposals below will address both conclusions, and provide a set of regulations that is equitable, and appropriately limited to addressing both the absence of a BIU standard for non-GSO systems and a milestone-based deployment approach in specific bands and services

## Proposals

### A. Proposals for Bringing into Use:

## ARTICLE 11

### **Notification and recording of frequency assignments<sup>1, 2, 3, 4, 5, 6, 7, 8</sup> (WRC-15)**

#### **Section II – Examination of notices and recording of frequency assignments in the Master Register**

MOD USA/7A/1

**11.44** The notified date<sup>24, MOD25, MOD26</sup> of bringing into use of any frequency assignment to a space station of a satellite network or system shall be not later than seven years following the date of receipt by the Bureau of the relevant complete information under No. 9.1 or 9.2 in the case of satellite networks or systems not subject to Section II of Article 9 or under No. 9.1A in the case of satellite networks or systems subject to Section II of Article 9. Any frequency assignment not brought into use within the required period shall be cancelled by the Bureau after having informed the administration at least three months before the expiry of this period. (WRC-19)

**Reasons:** To include in Article **11**, provisions for addressing the bringing into use of all non-GSO systems.

NOC USA/7A/2

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<sup>24</sup> **11.44.1**

**Reasons:** Consequential clarification



MOD USA/7A/3

<sup>25</sup> **11.44.2** The notified date of bringing into use of a frequency assignment to a space station of a satellite network or system shall be the date of the commencement of the continuous period defined in No. **11.44B** or **MOD**No. 11.44C, as applicable. (WRC-19)

**Reasons:** Modification to add non-GSO systems to No. **11.44.2**. Removal of the reference to 90-days is a consequence of the proposal to have different BIU periods for GSO and non-GSO frequency assignments. The GSO period remains specified in No. **11.44B**.

MOD USA/7A/4

<sup>26</sup> **11.44.3, 11.44B.1** and 11.44C.3 Upon receipt of this information and whenever it appears from reliable information available that a notified frequency assignment has not been brought into use in accordance with No. 11.44, No. 11.44B or **MOD**No. 11.44C, as the case may be, the consultation procedures and subsequent applicable course of action prescribed in No. 13.6 shall apply, as appropriate. (WRC-19)

**Reasons:** Consequential modification to extend the current regulation to non-GSO system frequency assignments.

MOD USA/7A/5

**11.44C** A frequency assignment to a space station in a non-geostationary-satellite orbit with the “Earth” as the reference body shall be considered as having been brought into use when a space station in the non-geostationary-satellite orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained on one of the notified orbital planes<sup>ADDWW</sup> of the non-geostationary satellite system for a continuous period of one day<sup>ADDXX</sup>. The notifying administration shall so inform the Bureau within 30 days from the start of the one-day period<sup>MOD26, ADDYY</sup>. On receipt of the information sent under this provision, the Bureau shall make that information available on the ITU website as soon as possible and shall publish it in the BR IFIC subsequently. (WRC-19)

**Reasons:** This new provision provides a fixed period of one day for continuous deployment with the capability of transmitting/receiving frequency assignments to constitute BIU of frequency assignments to non-GSO systems. This period is long enough to enable the notifying administration to ascertain the spacecraft’s status. The 90-day period for GSO is not needed, as that period was selected to be a deterrent against the GSO-specific practice known as satellite hopping. Making the reporting obligation extend from the start of the one-day period, rather than from the end of the period, means there will be inconsistency with the obligation in No. **11.47** to confirm BIU within 30 days of the end of the seven-year regulatory period; the start of the one-day period has to be before the end of regulatory period.

ADD USA/7A/6

<sup>ww</sup> **11.44C.1** For purposes of **MOD**No. 11.44C, the term “notified orbital plane” means an orbital plane of the non-GSO system, as provided to the Bureau in the most recent advance publication, coordination or notification information for the system’s frequency assignments, that possesses the general characteristics of Items A.4.b.4.a through A.4.b.4.f in Table A of Annex 2 to Appendix 4. (WRC-19)

**Reasons:** This new provision provides a description of what is meant by the term “notified orbital plane” for purposes of the new regulation in **MODNo. 11.44C**. The goal here is to characterize the orbit in a manner consistent with Appendix 4, but not to specify any specific orbital tolerances for individual parameters. The subject of tolerances for non-GSO system frequency assignments requires further ITU-R study in terms of the list of characteristics that may be appropriate for specification; the values of any tolerances for listed characteristics; and whether any distinction needs to be drawn for tolerances between satellite services in which non-GSO systems are operated.

ADD USA/7A/7

<sup>XX</sup> **11.44C.2** A frequency assignment to a space station in a non-geostationary-satellite system with a reference body that is not “Earth” shall be considered as having been brought into use when the notifying administration informs the Bureau that a space station with the capability of transmitting or receiving that frequency assignment has been deployed and operated in accordance with the notification information. (WRC-19)

**Reasons:** This provision creates an exception to the general rule requiring deployment into a notified orbital plane for frequency assignments to non-GSO systems that do not specify the Earth as the reference body in Appendix 4. Here, due to the variety of potential systems, mostly of a scientific nature, there is no fixed period required for confirmation of BIU by the notifying administration.

ADD USA/7A/8

<sup>YY</sup> **11.44C.4** A frequency assignment to a space station in a non-geostationary-satellite orbit, and with a notified date of bringing into use more than 30 days prior to the date of receipt of the notification information, shall also be considered as having been brought into use if the notifying administration confirms, when submitting the notification information for this assignment, that a space station in a notified orbital plane (see also **ADDNo. 11.44C.1**) with the capability of transmitting or receiving that frequency assignment has been deployed and maintained as provided for in **MODNo. 11.44C** for a continuous period of time from the notified date of bringing into use until the date of receipt of the notification information for this frequency assignment. (WRC-19)

**Reasons:** This provision provides a parallel provision to No. **11.44B.2** to clarify that BIU confirmation can occur more than 30 days after completion of BIU.

MOD USA/7A/9

**11.49** Wherever the use of a recorded frequency assignment to a space station is suspended for a period exceeding six months, the notifying administration shall inform the Bureau of the date on which such use was suspended. When the recorded assignment is brought back into use, the notifying administration shall, subject to the provisions of No. 11.49.1 when applicable, so inform the Bureau, as soon as possible. On receipt of the information sent under this provision, the Bureau shall make that information available as soon as possible on the ITU website and shall publish it in the BR IFIC. The date on which the recorded assignment is brought back into use<sup>28, ADDUU, ADDVV</sup> shall be not later than three years from the date on which the use of the frequency assignment was suspended, provided that the notifying administration informs the Bureau of the suspension within six months from the date on which the use was suspended. If the notifying administration informs the Bureau of the suspension more than six months after the date on which the use of the frequency assignment was suspended, this three-year time period shall be reduced. In this case, the amount by which the three-year period shall be reduced shall be equal to the amount of time that has elapsed between the end of the six-month period and the date that the Bureau is informed of the suspension. If the

notifying administration informs the Bureau of the suspension more than 21 months after the date on which the use of the frequency assignment was suspended, the frequency assignment shall be cancelled. (WRC-19)

**Reasons:** The addition of new footnotes <sup>ADDUU</sup> and <sup>ADDVV</sup> is necessary to allow the establishment of parallel provisions for bringing frequency assignments to non-GSO systems back into use following a suspension.

ADD USA/7A/10

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<sup>UU</sup> **11.49.2** The date of bringing back into use of a frequency assignment to a space station in the non-geostationary-satellite orbit with the “Earth” as the reference body shall be the date of the commencement of the one-day period defined below. A frequency assignment to such a space station in the non-geostationary-satellite orbit shall be considered as having been brought back into use when a space station in the non-geostationary-satellite orbit with the capability of transmitting or receiving that frequency assignment has been deployed and maintained on one of the notified orbital planes (see also **ADDNo. 11.44C.1**) for a continuous period of one day. The notifying administration shall so inform the Bureau within 30 days from the end of the one-day period. (WRC-19)

**Reasons:** This provision parallels **ADDNo. 11.44C** for bringing back into use.

USA/7A/11 ADD

<sup>VV</sup> **11.49.3** A frequency assignment to a space station in a non-geostationary-satellite system with a reference body that is not “Earth” shall be considered as having been brought back into use when the notifying administration informs the Bureau that a space station with the capability of transmitting or receiving that frequency assignment has been deployed and operated in accordance with the notification information. (WRC-19)

**Reasons:** This provision parallels **ADDNo. 11.44C.2** for bringing back into use.

**B. Proposals for a Milestone-Based Deployment Approach for Specific Bands and Services:**

## ARTICLE 11

### **Notification and recording of frequency assignments<sup>1, 2, 3, 4, 5, 6, 7, 8</sup> (WRC-15)**

ADD USA/7A/12

#### **Section III – Maintenance of the recording of frequency assignments to non-GSO satellite systems in the Master Register**

**Reasons:** This provision establishes a new Section III in Article 11 to serve as the location for the new provision **ADDNo. 11.51** below to serve as the mechanism to make new Resolution [NGSO-MILESTONES] (WRC-19) mandatory for those systems included in the Resolution.

ADD USA/7A/13

**11.51** For frequency assignments to some non-GSO satellite systems in specific bands and services, Resolution [NGSO- Milestones] (WRC-19) shall apply. (WRC-19)

**Reasons:** This provision is the mechanism to make the new Resolution mandatory for all non-GSO systems in the bands and services to which the Resolution applies.

## ARTICLE 13

### Instructions to the Bureau

#### Section II – Maintenance of the Master Register and of World Plans by the Bureau

MOD

USA/7A/14

**13.6**        *b)*            whenever it appears from reliable information available that a recorded assignment has not been brought into use, or is no longer in use, or continues to be in use but not in accordance with the notified required characteristics<sup>ADD1</sup> as specified in Appendix 4, the Bureau shall consult the notifying administration and request clarification as to whether the assignment was brought into use in accordance with the notified characteristics or continues to be in use in accordance with the notified characteristics. Such a request shall include the reason for the query. In the event of a response and subject to the agreement of the notifying administration the Bureau shall cancel, suitably modify, or retain the basic characteristics of the entry. If the notifying administration does not respond within three months, the Bureau shall issue a reminder. In the event the notifying administration does not respond within one month of the first reminder, the Bureau shall issue a second reminder. In the event the notifying administration does not respond within one month of the second reminder, action taken by the Bureau to cancel the entry shall be subject to a decision of the Board. In the event of non-response or disagreement by the notifying administration, the entry will continue to be taken into account by the Bureau when conducting its examinations until the decision to cancel or modify the entry is made by the Board. In the event of a response, the Bureau shall inform the notifying administration of the conclusion reached by the Bureau within three months of the administration's response. When the Bureau is not in a position to comply with the three-month deadline referred to above, the Bureau shall so inform the notifying administration together with the reasons therefor. In case of disagreement between the notifying administration and the Bureau, the matter shall be carefully investigated by the Board, including taking into account submissions of additional supporting materials from administrations through the Bureau within the deadlines as established by the Board. The application of this provision shall not preclude the application of other provisions of the Radio Regulations. (WRC-19)

**Reasons:** This provision adds a note to No. **13.6** to indicate that Resolution [NGSO-MILESTONES] (WRC-19) addresses one aspect of what it means for certain non-GSO systems to be operating in accordance with their notified characteristics.

ADD

USA/7A/15

<sup>1</sup> **13.6.1** See also ADDNo. 11.51, frequency assignments to non-geostationary satellite systems recorded in the Master Register.

**Reasons:** This provision is a new note to No. **13.6** to indicate that Resolution [NGSO-MILESTONES] (WRC-19) addresses one aspect of what it means for certain non-GSO systems to be operating in accordance with their notified characteristics.

RESOLUTION [NGSO-MILESTONES] (WRC-19)

**A milestone-based approach for the implementation of frequency assignments to space stations in a non-geostationary-orbit satellite system in certain bands and services**

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

*considering*

- a)* that all frequency assignments to space stations in a non-geostationary orbit (non-GSO) system are considered to be brought into use when one space station with the capability of transmitting or receiving those frequency assignments has been deployed into one of the notified orbital planes within seven years of the initial advance publication or coordination filing, as appropriate;
- b)* that in some cases, frequency assignments to space stations in non-GSO systems are recorded in the Master International Frequency Register (Master Register) without confirmation to the Radiocommunication Bureau (Bureau) by the notifying administration that space stations in all notified orbital planes and/or all space stations per notified orbital plane have been deployed;
- c)* that design considerations, availability of launch vehicles to support multiple-satellite launches, and other factors mean that notifying administrations may require longer than the regulatory period stipulated in No. 11.44 to complete implementation of non-GSO systems that contain the filed numbers of notified orbital planes and satellites per orbital plane;
- d)* that any discrepancies between the deployed number of orbital planes/satellites per orbital plane of a non-GSO system and the MIFR have, to date, not significantly impinged upon the efficient use of the orbital/spectrum resource in any frequency band used by non-GSO systems;
- e)* that since 2011, filings of frequency assignments to multiple non-GSO systems employing hundreds to thousands of non-GSO satellites per system, in particular frequency bands allocated to the fixed-satellite service (FSS) or mobile-satellite service (MSS), have led to a re-examination by the ITU-R of the impact of discrepancies mentioned in *considering d)* and the efficient use of the orbital/spectrum resource in those bands;
- f)* that ITU-R studies of the issue have shown that in certain frequency bands and services used or proposed for use by non-GSO systems, the adoption of a milestone-based system to facilitate deployment of non-GSO systems that correspond to MIFR entries in terms of the number of orbital planes and the number of satellites per orbital plane will improve the efficient use of the orbital/spectrum resource in those frequency bands and services;
- g)* that there is a need to seek a balance between the prevention of spectrum warehousing, the proper functioning of coordination mechanisms and the operational requirements related to the deployment of a non-geostationary satellite system;
- h)* that because extensions to milestones are undesirable, as they create uncertainty with respect to the configuration of the non-GSO FSS system deployment with which other systems must coordinate, and any milestones that may be established should allow enough time to accommodate unforeseen difficulties such as launch failures,

*recognizing*

- a) **MOD**No. 11.44C addresses the bringing into use of frequency assignments to non-GSO satellite systems;
- b) that new regulations for management of frequency assignments to non-GSO systems in the Master International Frequency Register should not impose an unnecessary regulatory burden;
- c) that the Bureau is required under No. 13.6, whenever it appears from reliable information available that a recorded assignment continues to be in use but not in accordance with the notified required characteristics as specified in Appendix 4, to consult the notifying administration and request clarification as to whether the assignment was brought into use in accordance with the notified characteristics or continues to be in use in accordance with the notified characteristics;
- d) that the number of orbital planes in a non-GSO system (item A.4.b.1) and the number of satellites in each orbital plane (item A.4.b.4.b) are among the notified required characteristics as specified in Appendix 4;
- e) that since No. 13.6 is applicable to non-GSO systems with frequency assignments that were confirmed to have been brought into use prior to the 1 January 2021 in the bands and services to which this Resolution applies, transitional measures are required to enable affected notifying administrations the opportunity to either confirm deployment of satellites in accordance with the Appendix 4 characteristics specified in *recognizing d)* above, or to complete deployment in accordance with this Resolution;
- f) that it is not necessary or appropriate for the Bureau, in the interest of improving the efficient use of the orbital/spectrum resource or otherwise, to routinely use the procedures of No. 13.6 to seek confirmation of the deployment of the number of satellites in notified orbital planes for non-geostationary satellite orbit systems in frequency bands and services not listed in *resolves 1* of this Resolution,

*recognizing further*

that this Resolution relates to those aspects of non-GSO systems to which *resolves 1* applies in regard with the notified required characteristics as specified in Appendix 4. The conformity of the notified required characteristics of the non-GSO systems other than those referred to in *recognizing d)* above is outside the scope of this Resolution,

*noting*

that for the purpose of this Resolution:

- the term “frequency assignments” is understood to refer to notified frequency assignments to a space station in a non-geostationary-satellite orbit with the capability of transmitting and receiving that frequency assignment either when the Bureau has not yet completed its examination under Section II of Article 11, or when the assignments is recorded in the MIFR;
- the “total number of satellites” is understood to mean the sum of the various values of Appendix 4 data item A.4.b.4.b associated with the notified orbital planes,

*resolves*

1 that this Resolution applies to frequency assignments to non-geostationary satellite systems brought into use in accordance with Nos. 11.44 and/or **MOD**11.44C, as applicable, in bands and only for services listed in the Table below:

**Frequency bands and services considered for application for milestone-based approach**

<b><u>Bands (GHz)</u></b>	<b><u>Space Radiocommunication services</u></b>
10.7-11.45	FSS
11.45-11.7	FSS
11.7-12.75	FSS

<u>Bands (GHz)</u>	<u>Space Radiocommunication services</u>
12.75-13.25	FSS
13.75-14.5	FSS
17.3-17.7	FSS
17.7-19.7	FSS (except non-GSO MSS feeder links)
19.7-20.2	FSS and MSS
27-27.5	FSS
27.5-29.5	FSS (except non-GSO MSS feeder links)
29.5-30	FSS and MSS
37.5-39.5	FSS
39.5-40.5	FSS and MSS
40.5-42.5	FSS and BSS
47.2-50.2	FSS
50.4-51.4	FSS

2 that for notifying administrations of frequency assignments to non-geostationary satellite systems to which *resolves 1* applies, and for which the end of the seven-year regulatory period is after 1 January 2021, the following provisions shall apply:

- a) no later than 30 days after the end of the regulatory period specified in No. 11.44 or 30 days after the end of the BIU period in No. 11.44C whichever comes last, the notifying administration shall communicate to the Bureau the complete deployment information in accordance with Annex 1 to this Resolution;
- b) if the number of satellites communicated to the Bureau under subsection a) of *resolves 2* is not 100% of the total number of satellites indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system, the Bureau shall, after informing the notifying administration, add a remark to the Master Register entry for the frequency assignments to the system stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19);

3 that, the notifying administrations of frequency assignments to non-geostationary satellite systems to which subsection b) of *resolves 2* applies shall communicate to the Bureau the complete deployment information in accordance with Annex 1 to this Resolution:

- a) no later than 30 days after the expiry of the two-year period after the end of the seven-year period referred to in No. 11.44;
- b) no later than 30 days after the expiry of the five-year period after the end of the seven-year period referred to in No. 11.44;
- c) no later than 30 days after the expiry of the seven-year period after the end of the seven-year period referred to in No. 11.44;

3.1 that, if the number of space stations deployed under *resolves 3a*) is less than 10% of the total number of satellites (rounded down to the lower integer) indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system, the notifying administration shall also submit to the Bureau, no later than 90 days from the end of the two-year period referred to in *resolves 3a*), modifications to the notified characteristics of the frequency assignments, taking into consideration that the modified total number of satellites shall not be greater than ten (10) times the number of space stations deployed under *resolves 3a*) and the Bureau shall, after informing the notifying

administration and without removing the remark stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19), modify the Master Register entry for the frequency assignments to the system accordingly;

- 3.2 that, if the number of space stations deployed under *resolves 3b*) is less than 50% of the total number of satellites (rounded down to the lower integer) indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system, the notifying administration shall also submit to the Bureau, no later than 90 days from the end of the five-year period referred to in *resolves 3b*), modifications to the notified characteristics of the recorded frequency assignments in the Master Register, taking into consideration that the modified total number of satellites shall not be greater than two (2) times the number of space stations deployed under *resolves 3b*) and the Bureau shall, after informing the notifying administration and without removing the remark stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19), modify the Master Register entry for the frequency assignments to the system accordingly;
- 3.3 that, if the number of space stations deployed under *resolves 3c*) is less than 100 of the total number of satellites indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system, the notifying administration shall also submit to the Bureau, no later than 90 days from the end of the seven-year period referred to in *resolves 3c*), modifications to the notified characteristics of the recorded frequency assignments in the Master Register, taking into consideration that the modified total number of satellites shall not be greater than the number of space stations deployed under *resolves 3c*) and the Bureau shall, after informing the notifying administration, remove the remark stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19) and modify the Master Register entry for the frequency assignments to the system accordingly;
- 4 that notifying administrations of frequency assignments to non-geostationary satellite systems to which *resolves 1* applies, and for which the end of the regulatory period specified in No. 11.44 has expired prior to 1 January 2021, shall communicate to the Bureau the complete deployment information in accordance with Annex 1 to this Resolution:
- a) no later than 1 July 2021;
  - b) no later than 1 February 2024 (for systems to which *resolves 4.1* below applies);
  - c) no later than 1 February 2027 (for systems to which *resolves 4.1* below applies);
  - d) no later than 1 February 2029 (for systems to which *resolves 4.1* below applies);
- 4.1 that, if the number communicated to the Bureau under *resolves 4a*) is not 100% of the total number of satellites indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system, the Bureau shall, after informing the notifying administration, modify the Master Register entry for the frequency assignments to the system to add a remark stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19);
- 4.2 that, if the number of space stations deployed under *resolves 4b*) is less than 10% of the total number of satellites (rounded down to the lower integer) indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system, the notifying administration



shall also submit to the Bureau, no later than 1 April 2024, modifications to the notified characteristics of the recorded frequency assignments in the Master Register, taking into consideration that the modified total number of satellites shall not be greater than ten (10) times the number of space stations deployed under *resolves 4b*) and the Bureau shall, after informing the notifying administration and without removing the remark stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19), modify the Master Register entry for the frequency assignments to the system accordingly;

4.3 that, if the number of space stations deployed under *resolves 4c*) is less than 50% of the total number of satellites (rounded down to the lower integer) indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system, the notifying administration shall also submit to the Bureau, no later than 1 April 2027, modifications to the notified characteristics of the recorded frequency assignments in the Master Register, taking into consideration that the modified total number of satellites shall not be greater than two (2) times the number of space stations deployed under *resolves 4c*) and the Bureau shall, after informing the notifying administration and without removing the remark stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19), modify the Master Register entry for the frequency assignments to the system accordingly;

4.4 that, if the number of space stations deployed under *resolves 4d*) is less than 100% of the total number of satellites indicated in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system, the notifying administration shall also submit to the Bureau, no later than 1 April 2029, modifications to the notified characteristics of the recorded frequency assignments in the Master Register, taking into consideration that the modified total number of satellites shall not be greater than the number of space stations deployed under *resolves 4d*) and the Bureau shall remove the remark stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19) and modify the Master Register entry for the frequency assignments to the system accordingly;

5 that the Bureau shall, no later than forty-five (45) days before any deadline for submission by a notifying administration under subsection *a*) of *resolves 2*, subsections *a*), *b*) or *c*) of *resolves 3*, subsections *a*), *b*), *c*), or *d*) of *resolves 4*, send a reminder to the notifying administration to provide the information required;

6 that, upon the submission by a notifying administration of the modification information called for in *resolves 3* (including *resolves 3.1* to *3.3*, as applicable), *resolves 4* (including *resolves 4.2* to *4.4*, as applicable), the Bureau shall conduct an examination for conformity under No. 11.31;

7 that, if, and only if:

a) the examination for conformity under No. 11.31 from *resolves 6* above is favorable;

b) the modifications to the notified orbital parameters is limited to reduction of the number of orbital planes (item A.4.b.1 in Appendix 4), reduction of the number of satellites per plane (item A.4.b.4.b in Appendix 4), modification of the right ascension of the ascending node of each plane (item A.4.b.5.a in Appendix 4), modification of the initial phase angle of each satellite (item A.4.b.5.b in Appendix 4); and

c) the notifying administration has submitted with its latest Appendix 4 information a commitment stating that the characteristics as modified will not cause more interference or require more protection than the characteristics provided in the latest notification information published in

Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system characteristics;

the Bureau shall conclude for purposes of No. **11.43B** that the changes do not increase the probability of harmful interference to assignments already recorded;

8 that the Bureau shall publish its findings in application of *resolves* 7 in the BR IFIC and promptly make them available on the ITU website, and the modified assignments shall retain their original date of entry in the Master Register, if the changes do not increase the probability of harmful interference to assignments already recorded;

9 that, if the number communicated to the Bureau under subsection *a)* of *resolves* 2, subsections *a)*, *b)* or *c)* of *resolves* 3 or subsections *a)*, *b)*, *c)*, or *d)* of *resolves* 4, is 100% of the total number of satellites indicated in the Master Register entry for the non-geostationary satellite system, the Bureau shall modify the Master Register entry for the frequency assignments to the system to remove the remark stating that the assignments are subject to the application of Resolution [NGSO-MILESTONES] (WRC-19);

10 that, if a notifying administration fails to communicate the information required under subsection *a)* of *resolves* 2, subsections *a)*, *b)* or *c)* of *resolves* 3, or subsections *a)*, *b)*, *c)*, or *d)* of *resolves* 4, and has not previously communicated to the Bureau that 100% of the total number of satellites indicated in the Master Register entry or notification of the non-geostationary satellite system, the Bureau shall promptly send to the notifying administration a reminder asking to the administration to provide the required information within thirty (30) days from the date of reminder from the Bureau;

11 that, if a notifying administration fails to provide information after the reminder sent under *resolves* 10, the Bureau shall send to the notifying administration a second reminder asking to provide the required information within fifteen (15) days from the date of the second reminder;

12 that, if a notifying administration fails to provide the required information under *resolves* 11, the Bureau shall treat the entry in the Master Register as it would a non-response under No. **13.6**, and continue to take the entry into account when conducting its examinations until the decision is made by the Board to cancel the entry or modify the entry by suppressing the notified orbital parameters of all satellites not listed in the last complete deployment information submitted under *resolves* 3 or 4, as appropriate,

13 that the suspension of the use of frequency assignments under No. **11.49** at any point prior to the end of the applicable milestone periods specified in *resolves* 3 or 4 of this Resolution shall not alter or reduce the requirements associated with any of the remaining milestones as derived from *resolves* 3 or 4 of this Resolution, as applicable.

*instructs the Radiocommunication Bureau*

- 1 to take necessary actions to implement this Resolution;
- 2 to report to subsequent WRCs on the result of implementation of this Resolution, as appropriate.

## ANNEX 1 TO RESOLUTION [NGSO-MILESTONES] (WRC-19)

### **Information to be submitted about the deployed space stations**

#### **A Satellite system information**

1. Name of the satellite system
2. Name of the notifying administration

3. Country symbol
4. Number of space stations deployed in each notified orbital plane of the system with the capability of transmitting or receiving the frequency assignments.

**B Space station information to be provided for each deployed space station**

1. Name of the launch vehicle provider
2. Name and location of the launch facility
3. Launch date.

**Reasons:** This Resolution contains and implements the milestone-based deployment approach for frequency assignments to certain FSS and MSS non-GSO systems in specific frequency bands. It specifies that for all subject non-GSO systems with frequency assignments for which the seven-year regulatory period of No. **11.44** ends on or after 1 January 2021, the milestones will be 10% at Year 9 (2 years after the end of the regulatory period) with a deployment factor of 10; 50% at Year 12 (5 years after the end of the regulatory period) with a deployment factor of 2; and 100% at Year 14 (7 years after the end of the regulatory period) with a deployment factor of 1. For all subject non-GSO systems with frequency assignments for which the seven-year regulatory period of No. **11.44** ends before 1 January 2021, the same milestones will be applied at fixed periods from 1 January 2021 for those systems that do not report 100% deployment on or before 1 July 2021. This is a limited application (to address the specific concerns noted by the Bureau in its report to WRC-15), that imposes a milestone schedule that is geared to large-system deployment realities, and provides equitable treatment for existing, pending, and future systems.

MOD USA/7A/17

APPENDIX 4 (REV.WRC-15)

**Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III**

ANNEX 2

**Characteristics of satellite networks, earth stations  
or radio astronomy stations<sup>2</sup>** (Rev.WRC-12)

**Footnotes to Tables A, B, C and D**

TABLE A

**Table of characteristics to be submitted for space and radio astronomy services**  
(Rev.WRC -12)

Items in Appendix	A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II	Notification or coordination of a geostationary-satellite network (including	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
***	***									***		
A.18	<b>COMPLIANCE WITH NOTIFICATION OF AIRCRAFT EARTH STATION(S)</b>											
A.18.a	<p>a commitment that the characteristics of the aircraft earth station (AES) in the aeronautical mobile-satellite service are within the characteristics of the specific and/or typical earth station published by the Bureau for the space station to which the AES is associated</p> <p>Required only for the band 14-14.5 GHz, when an aircraft earth station in the aeronautical mobile-satellite service communicates with a space station in the fixed-satellite service</p>				+	+				A.18.a		
A.19	<b>COMPLIANCE WITH § 6.26 OF ARTICLE 6 OF APPENDIX 30B</b>									A.19		
A.19.a	<p>a commitment that the use of the assignment shall not cause unacceptable interference to, nor claim protection from, those assignments for which agreement still needs to be obtained</p> <p>Required if the notice is submitted under § 6.25 of Article 6 of Appendix 30B</p>								+	A.19.a		
A.20	<b>COMPLIANCE WITH Resolves 7c) of Resolution [NGSO-MILESTONES] (WRC-19)</b>									A.20		

A.20.a	a commitment stating that the characteristics as modified will not cause more interference or require more protection than the characteristics provided in the latest notification information published in Part I-S of the BR IFIC for the frequency assignments to the non-geostationary satellite system characteristics						O				A.20.a	
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**Reasons:** This Appendix 4 element is needed to implement *resolves 7c*) of Draft New Resolution [NGSO-MILESTONES] (WRC-19).

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## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 7

##### Issue H

**Agenda Item 7:** to consider possible changes, and other options, in response to Resolution 86 (Rev. Marrakesh, 2002) of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;

**Issue H** - Modifications to RR Appendix 4 items to be provided for non-geostationary satellite systems not subject to the procedures of Section II of RR Article 9

#### **BACKGROUND:**

The RR Appendix 4 items provided in the API for frequency assignments to non-GSO satellite networks or systems in bands not subject to coordination under Section II of RR Article 9 are used initially by administrations to identify potential interference scenarios to their existing and planned systems and to formulate their comments under RR No. 9.3. The capability of these administrations to identify such potential scenarios depends, amongst other things, on whether the satellite orbits can be properly modelled based on the information provided in the API. The modelling of the orbit of satellites of non-GSO systems requires significantly more information than a GSO satellite network. Recent analysis performed for non-GSO satellite networks or systems based on APIs as published in the Radiocommunication Bureau International Frequency Information Circular (also known as BR IFIC) have shown that, in some instances, there is a need for additional information in order to properly model the satellite orbits.

Issue H relates to the need to ensure that enough orbital characteristics are provided in the advance publication information (API) for frequency assignments to non-geostationary (non-GSO) satellite systems in bands not subject to coordination under Section II of RR Article 9 which would allow potentially affected administrations to model a non-GSO satellite system as soon as the API is published. With the results of its analysis, they will be able to present their concerns to the notifying Administration and the Radiocommunication Bureau under RR No. 9.3.

As a result, the ITU-R identified a single method to address this Issue. This only method proposes to extend the requirement to provide additional technical parameters for frequency assignments of non-GSO satellite systems in bands subject to coordination under Section II of RR Article 9 of RR Appendix 4 (namely the right ascension of the ascending node, the longitude of the ascending node and the associated date and time, the argument of the perigee) to API and notification filings for frequency assignments to non-GSO satellite systems in bands not subject to coordination under Section II of RR Article 9. Those requirements would apply only for non-GSO satellite systems, for which the relative distribution of the orbital planes and satellites is known, identified by additional RR Appendix 4 data item. It is also proposed to add new RR Appendix 4 data items for frequency assignments to non-GSO satellite systems in bands not subject to coordination under Section II of Article 9: mandatory item, identifying whether the orbit is sun-synchronous or not, and optional item, providing the Local Time of the Ascending Node (LTAN) for sun-synchronous orbits. The proposed additional data elements, consistent with the only Method in the draft CPM text, are necessary to properly model the NGSO satellite orbits and assist in the analysis of the impacts of such systems

Proposal:

MOD USA/7(H)/1

## APPENDIX 4 (REV.WRC-19)

### **Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III**

**Reasons:** Add new RR Appendix 4 data items for frequency assignments to non-GSO satellite systems in bands not subject to coordination

MOD USA/7(H)/2

## ANNEX 2

### **Characteristics of satellite networks, earth stations or radio astronomy stations<sup>2</sup> (Rev.WRC-19)**

**Footnotes to Tables A, B, C and D**

MOD USA/7(H)/3

**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,  
 EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

<p>Items in Appendix</p>	<p><i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i></p>	<p>Advance publication of a geostationary-satellite network</p>	<p>Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9</p>	<p>Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9</p>	<p>Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)</p>	<p>Notification or coordination of a non-geostationary-satellite network</p>	<p>Notification or coordination of an earth station (including notification under Appendices 30A or 30B)</p>	<p>Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)</p>	<p>Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)</p>	<p>Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)</p>	<p>Items in Appendix</p>	<p>Radio astronomy</p>
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Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b	<b>For space station(s) onboard non-geostationary satellite(s):</b>										A.4.b	
A.4.b.1	the number of orbital planes			X		X					A.4.b.1	
A.4.b.2	the reference body code		X	X		X					A.4.b.2	
A.4.b.3	<b>For space stations of a non-geostationary fixed-satellite service system operating in the band 3 400-4 200 MHz:</b>										A.4.b.3	
A.4.b.3.a	the maximum number of space stations ( $N_N$ ) in a non-geostationary-satellite system simultaneously transmitting on a co-frequency basis in the fixed-satellite service in the Northern Hemisphere			X		X					A.4.b.3.a	
A.4.b.3.b	the maximum number of space stations ( $N_S$ ) in a non-geostationary-satellite system simultaneously transmitting on a co-frequency basis in the fixed-satellite service in the Southern Hemisphere			X		X					A.4.b.3.b	
A.4.b.4	<b>For each orbital plane, where the Earth is the reference body:</b>										A.4.b.4	
A.4.b.4.a	the angle of inclination ( $i_j$ ) of the orbital plane with respect to the Earth's equatorial plane ( $0^\circ \leq i_j < 180^\circ$ )			X		X					A.4.b.4.a	
A.4.b.4.b	the number of satellites in the orbital plane			X		X					A.4.b.4.b	

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.4.c	the period			X		X					A.4.b.4.c	
A.4.b.4.d	the altitude, in kilometres, of the apogee of the space station			X		X					A.4.b.4.d	
A.4.b.4.e	the altitude, in kilometres, of the perigee of the space station			X		X					A.4.b.4.e	
A.4.b.4.f	the minimum altitude of the space station above the surface of the Earth at which any satellite transmits			X		X					A.4.b.4.f	
A.4.b.4.g	the right ascension of the ascending node ( $\Omega_j$ ) for the $j$ -th orbital plane, measured counter-clockwise in the equatorial plane from the direction of the vernal equinox to the point where the satellite makes its South-to-North crossing of the equatorial plane ( $0^\circ \leq \Omega_j < 360^\circ$ ) only required in frequency bands subject to the provisions of Nos <b>9.11A</b> , <b>9.12</b> or <b>9.12A</b>					X					A.4.b.4.g	
A.4.b.4.h	the initial phase angle ( $\omega_i$ ) of the $i$ -th satellite in its orbital plane at reference time $t = 0$ , measured from the point of the ascending node ( $0^\circ \leq \omega_i < 360^\circ$ )			X		X					A.4.b.4.h	
A.4.b.4.i	the argument of perigee ( $\omega_p$ ), measured in the orbital plane, in the direction of motion, from the ascending node to the perigee ( $0^\circ \leq \omega_p < 360^\circ$ )			X		X					A.4.b.4.i	

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.4.j	<p>the longitude of the ascending node (<math>\theta_j</math>) for the j-th orbital plane, measured counter-clockwise in the equatorial plane from the Greenwich meridian to the point where the satellite orbit makes its South-to-North crossing of the equatorial plane (<math>0^\circ \leq \theta_j &lt; 360^\circ</math>)</p> <p>only required in frequency bands not subject to the provisions of Nos. 9.11A, 9.12 or 9.12A or subject to Nos. 22.5C, 22.5D or 22.5F</p> <p>Note - All satellites in the constellation must use the same reference time. If no reference time is provided in A.4.b.4.k and A.4.b.4.j, it is assumed to be <math>t=0</math></p>			<b>X</b>		<b>X</b>					A.4.b.4.j	
A.4.b.4.k	the date (day:month:year) at which the satellite is at the location defined by the longitude of the ascending node ( $\theta_j$ ), (see Note under A.4.b.4.h)			<b>O</b>		<b>O</b>					A.4.b.4.k	
A.4.b.4.l	the time (hours:minutes) at which the satellite is at the location defined by the longitude of the ascending node ( $\theta_j$ ), (see Note under A.4.b.4.h)			<b>O</b>		<b>O</b>					A.4.b.4.l	
A.4.b.5	<b>Not Used</b>											

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2/A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.6	<b>For space stations operating in a frequency band subject to Nos. 22.5C, 22.5D or 22.5F, additional data elements to characterize properly the orbital operation of the non-geostationary-satellite system:</b>										A.4.b.6	
A.4.b.6.a	<b>For each range of latitudes:</b>										A.4.b.6.a	
A.4.b.6.a.1	the maximum number of non-geostationary satellites transmitting with overlapping frequencies to a given location					X					A.4.b.6.a.1	
A.4.b.6.a.2	the associated start of the latitude range					X					A.4.b.6.a.2	
A.4.b.6.a.3	the associated end of the latitude range					X					A.4.b.6.a.3	
A.4.b.6.b	<b>Not used</b>										A.4.b.6.b	
A.4.b.6.c	an indicator showing whether the space station uses station-keeping to maintain a repeating ground track					X					A.4.b.6.c	

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2/A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.6.d	if the space station uses station-keeping to maintain a repeating ground track, the time in seconds that it takes for the constellation to return to its starting position, i.e. such that all satellites are in the same location with respect to the Earth and each other					+					A.4.b.6.d	
A.4.b.6.e	an indicator showing whether the space station should be modelled with a specific precession rate of the ascending node of the orbit instead of the $J_2$ term					X					A.4.b.6.e	
A.4.b.6.f	if the space station is to be modelled with a specific precession rate of the ascending node of the orbit instead of the $J_2$ term, the precession rate in degrees/day, measured counter-clockwise in the equatorial plane					+					A.4.b.6.f	
A.4.b.6.j	the longitudinal tolerance of the longitude of the ascending node					X					A.4.b.6.j	

Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b.7	<b>For space stations operating in a frequency band subject to Nos. 22.5C, 22.5D or 22.5F, the data elements to characterize properly the performance of the non-geostationary-satellite system:</b>										A.4.b.7	

**Reasons:** Extend the requirement to provide additional technical parameters for frequency assignments of non-GSO satellite systems in bands subject to coordination under Section II of RR Article 9 of RR Appendix 4 (namely the right ascension of the ascending node, the longitude of the ascending node and the associated date and time, the argument of the perigee) to API and notification filings for frequency assignments to non-GSO satellite systems in bands not subject to coordination under Section II of RR Article 9

**United States**

## PROPOSALS FOR THE WORK OF THE CONFERENCE

## Agenda item 7

## Issue I

**Agenda Item 7:** to consider possible changes, and other options, in response to Resolution **86 (Rev. Marrakesh, 2002)** of the Plenipotentiary Conference, an advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks, in accordance with Resolution **86 (Rev.WRC-07)**, in order to facilitate rational, efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit;  
**Issue I** - Additional RR Appendix 4 data items to be provided for non-geostationary satellite systems with multiple orbital planes

**BACKGROUND:**

In 2015, World Radiocommunication Conference (WRC-15) endorsed the recommendation of the Director of the Radiocommunication Bureau to allow two types of submissions for the Coordination Request (CR/C) for frequency assignments to non-geostationary (NGSO) satellite systems:

- 1 CR/C for frequency assignments to a NGSO satellite system with one (or more than one) set(s) of orbital characteristics with an indication that all frequency assignments of the system would be operated simultaneously;
- 2 CR/C for frequency assignments to a NGSO satellite system with different sets of orbital characteristics with an indication that the different sets of orbital planes would be mutually exclusive, i.e. satellites on these sets of orbits would not be operated simultaneously and only one of these sets of orbital planes would be implemented.

However, no modification was made to Appendix 4 of the Radio Regulations to ensure the proper identification of the type of CR/C, leading the Bureau to systematically seek clarification from notifying administrations in case of a submission of a CR/C for frequency assignments to NGSO satellite system composed of multiple orbital planes. Subsequently, the Radio Regulations Board adopted a Rule of Procedures for the receivability of NGSO systems which implements the two types of submissions as endorsed by WRC-15.

Although WRC-15 did not specifically address the case of frequency assignments to NGSO satellite systems with multiple planes in bands not subject to coordination under Section II of RR Article 9, it appears important to consider the same level of flexibility for submission of Advance Publication Information (API).

To remedy the situation and to improve the ability of affected administrations to understand the nature of the NGSO systems under consideration, it is proposed to add two new Appendix 4 data elements to determine the relationship between the various orbital planes listed in the API or CR/C, as appropriate. The attached proposal is consistent with the only method in the draft CPM Report on WRC-19 agenda item 7, issue I.

MOD USA/7(I)/1

## APPENDIX 4 (REV.WRC-19)

### **Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III**

**Reasons:** Add two new Appendix 4 data elements to determine the relationship between the various orbital planes listed in the API or CR/C, as appropriate

MOD USA/7(I)/2

## ANNEX 2

### **Characteristics of satellite networks, earth stations or radio astronomy stations<sup>2</sup> (Rev.WRC-19)**

#### **Footnotes to Tables A, B, C and D**

**Reasons:** Add two new Appendix 4 data elements to determine the relationship between the various orbital planes listed in the API or CR/C, as appropriate



MOD USA/7(I)/3

**TABLE A**  
**GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK,  
 EARTH STATION OR RADIO ASTRONOMY STATION** (Rev.WRC-19)

<p>Items in Appendix</p>	<p><i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i></p>	<p>Advance publication of a geostationary-satellite network</p>	<p>Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9</p>	<p>Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9</p>	<p>Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)</p>	<p>Notification or coordination of a non-geostationary-satellite network</p>	<p>Notification or coordination of an earth station (including notification under Appendices 30A or 30B)</p>	<p>Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)</p>	<p>Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)</p>	<p>Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)</p>	<p>Items in Appendix</p>	<p>Radio astronomy</p>
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Items in Appendix	<i>A - GENERAL CHARACTERISTICS OF THE SATELLITE NETWORK, EARTH STATION OR RADIO ASTRONOMY STATION</i>	Advance publication of a geostationary-satellite network	Advance publication of a non-geostationary-satellite network subject to coordination under Section II of Article 9	Advance publication of a non-geostationary-satellite network not subject to coordination under Section II of Article 9	Notification or coordination of a geostationary-satellite network (including space operation functions under Article 2A of Appendices 30 or 30A)	Notification or coordination of a non-geostationary-satellite network	Notification or coordination of an earth station (including notification under Appendices 30A or 30B)	Notice for a satellite network in the broadcasting-satellite service under Appendix 30 (Articles 4 and 5)	Notice for a satellite network (feeder-link) under Appendix 30A (Articles 4 and 5)	Notice for a satellite network in the fixed-satellite service under Appendix 30B (Articles 6 and 8)	Items in Appendix	Radio astronomy
A.4.b	<b>For space station(s) onboard non-geostationary satellite(s):</b>										A.4.b	
A.4.b.1	the number of orbital planes			X		X					A.4.b.1	
A.4.b.1.a	Indicator of whether all the orbital planes identified under A.4.b.1 describe a single configuration, multiple configurations that will operate simultaneously, or multiple configurations that are mutually exclusive. Required only for the advance publication information and coordination request of non-GSO satellite systems.			X		+					A.4.b.1.a	
A.4.b.4.a.1	In case the orbital planes identified under A.4.b.1 describe multiple mutually exclusive configurations, identification of the orbital planes that are associated with each of the mutually exclusive configurations. Required in the advance publication information and coordination request for non-GSO satellite systems.			X		+					A.4.b.4.a.1	
A.4.b.2	the reference body code		X	X		X					A.4.b.2	
A.4.b.3	<b>For space stations of a non-geostationary fixed-satellite service system operating in the band 3 400-4 200 MHz:</b>										A.4.b.3	

**Reasons:** Additional Appendix 4 data elements required to understand the relationship between the various orbital planes

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 9.1

##### Issue 9.1.4

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

9.1 on the activities of the Radiocommunication Sector since WRC-15;

9.1 (9.1.4) Resolution **763 (WRC-15)** - Stations on board sub-orbital vehicles

#### Introduction

The 2015 World Radiocommunication Conference (WRC-15) adopted Resolution **763 (WRC-15)** to deal with stations on board suborbital vehicles<sup>3</sup>. It was resolved to conduct studies during the WRC-19 study cycle:

- to identify any required technical and operational measures, in relation to stations on-board suborbital vehicles, that could assist in avoiding harmful interference between radiocommunication services.
- to determine spectrum requirements and, based on the outcome of those studies, to consider a possible future agenda item for WRC-23.

It is also noted that ITU-R in 2015 formulated Question ITU-R No. [259/5](#), "Operational and radio regulatory aspects for planes operating in the upper level of the atmosphere", and that studies in the framework of that Question are related to Resolution **763 (WRC-15)**. In particular, *decides* 3 of that Question asks, "what radio links will be required to support space planes operations and under what radiocommunication service definition will they fall?"

Suborbital vehicles, including space planes, have been developed to go beyond the major portion of the Earth's atmosphere for brief periods, however they also must share airspace with conventional aircraft during certain phases of flight. These vehicles can reach space and may perform a mission, such as deploying a space vehicle, conducting scientific research, or allowing tourists to participate in space flight, and then they return to the Earth's surface.

Communications with those sub-orbital vehicles currently consists of telemetry, telecommand, and control (TT&C), sometimes operating under the Space Operations Service (SOS), to allow for control of the vehicle, and mission-related communications. There are currently no radiocommunications between the air traffic management (ATM) or air traffic control (ATC) functions and sub-orbital vehicles.

Sub-orbital vehicles, however, must integrate safely into the same airspace as conventional aircraft during their transition to and from space. To address this, most air navigation service providers currently ensure safe integration by completely segregating sub-orbital vehicles from other aircraft during launch and recovery operations; clearing the airspace of non-participating aircraft in three spatial dimensions and in time to maintain the required level of safety. The dimensions of the cleared airspace are driven by existing launch range facility TT&C data capability.

The current airspace segregation approach comes at the expense of space launch and recovery opportunities, air traffic efficiency, and additional fuel and time required for aircraft to avoid hazardous areas. This method

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<sup>3</sup> Suborbital vehicle: A vehicle intended for sub-orbital flight, all or some stages or components of which may be reusable or expendable.

of separating space launch and recovery operations from air traffic will not be sustainable with the increase in demand for space access by additional sub-orbital vehicles operating on and off traditional ranges. As called for by Resolution **763 (WRC-15)**, ITU-R has developed a working document towards a preliminary draft new report ITU-R M.[SUBORBITAL VEHICLES] titled, “Radiocommunications for suborbital vehicles”. The work has been informed by the international civil aviation organization (ICAO) and Administrations and has identified planned future approaches to airspace integration that would avoid or reduce airspace segregation by enabling radio stations on-board sub-orbital vehicles to use frequencies allocated to terrestrial radiocommunications for the purpose of ATM/ATC voice/data communications, surveillance, and navigation services. Such approaches, if standardized by ICAO, would ensure interoperability of sub-orbital vehicles with the ATM/ATC and aircraft avionics, while maintaining flight safety of the sub-orbital vehicle and of other aircraft that occupy the airspace through which the sub-orbital vehicle traverses. This would enable ATC to regain lost air traffic efficiency, enhance airborne collision avoidance, and reduce fuel / emissions demand. The study suggests that it’s technically feasible for suborbital vehicles to operate under existing space and terrestrial radiocommunication service allocations, if permitted by the Radio Regulations, for the ATM/ATC applications identified in the report. Using existing allocations would provide international harmonization and interoperability with those systems and applications related to aviation safety, as standardized by ICAO, such as ATM/ATC and aircraft avionics. There have been questions raised regarding whether the regulatory provisions within the ITU-R Radio Regulations (RR) for terrestrial and space services are adequate to support these types of approaches to the integration of suborbital vehicles into the ATM, and whether additional spectrum provisions may be needed.

### **Conclusions**

Studies have shown that further consideration is needed with regards to the definition of a sub-orbital vehicle in the Radio Regulations and under which radiocommunications service(s) they should operate. Studies also indicate that at certain altitudes, additional technical and operational measures may be needed to ensure safety-of-flight operations of suborbital vehicles and aircraft, which is the responsibility of ICAO. For example, ATM applications require radio equipment that’s interoperable with ICAO standardized systems, in all phases of flight, to prevent collisions with conventional aircraft. Additional technical studies and regulatory provisions are therefore necessary to improve the integration of sub-orbital vehicles into the ATM systems. The results of these studies could suggest needed modifications to the Radio Regulations.

SUP USA/4859A21A4/1

## RESOLUTION 763 (WRC-15)

### **Stations on board sub-orbital vehicles**

The World Radiocommunication Conference (Geneva, 2015),

**Reasons:** The studies being conducted in the ITU-R study groups on this issue have been concluded.

## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 9.1

##### Issue 9.1.9

**Agenda Item 9** to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

**9.1** on the activities of the Radiocommunication Sector since WRC-15;

**9.1 (9.1.9):** Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)

#### **BACKGROUND:**

Resolution **162 (WRC-15)** resolves to invite ITU-R to conduct studies considering additional spectrum needs for development of the fixed-satellite service (FSS) and conduct sharing and compatibility studies with existing services to determine the suitability of new primary allocations to the FSS in the frequency band 51.4-52.4 GHz (Earth-to-space) limited to FSS gateway links for geostationary orbit use, and the possible associated regulatory actions.

ITU-R has conducted studies required by Resolution **162 (WRC-15)**. The results of analysis of additional spectrum needs are contained in DN Report ITU-R S.[SPECTRUM\_NEEDS]. The results of sharing and compatibility studies with incumbent services including the fixed service (FS), mobile service (MS), Earth exploration-satellite service (EESS) (passive), radio astronomy service (RAS), and sharing with potential IMT-2020 applications are contained in PDN Report ITU-R S.[SPECTRUM\_SHARING].

Based on the results of studies, no change is proposed to Article 5 of the Radio Regulations unless adequate protection to the passive services operating in the frequency band 52.6 – 54.25GHz can be protected.

## ARTICLE 5

### Frequency allocations

#### Section IV – Table of Frequency Allocations

(See No. 2.1)

NOC USA/9.1(9.1.9)/1

#### 51.4-55.78 GHz

Allocation to services		
Region 1	Region 2	Region 3
51.4-52.6	FIXED 5.338A MOBILE 5.547 5.556	
52.6-54.25	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 5.556	
54.25-55.78	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.556A SPACE RESEARCH (passive) 5.556B	

**Reasons:** The ITU-R studies have shown that coexistence between the fixed-satellite service (FSS) Earth-to-space and the incumbent active services can be achieved, but any assignment must ensure the protection of passive services.



## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 10

**Agenda Item 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.

#### Background

The 2007 World Radiocommunication Conference (WRC-07) modified Appendix 4 Annex 2 of the Radio Regulations to allow the characteristics of active and passive sensors to be filed in the ITU-R under the provisions of Articles 9 and 11 so they may be recorded in the Master International Frequency Register.

Any frequency assignment recorded in the Master Register with a favourable finding under No. 11.31 shall have the right to international recognition. For such an assignment, this right means that other administrations shall take it into account when making their own assignments, in order to avoid harmful interference. (RR No. 8.3) Nevertheless, Nos. 5.28 to 5.31 place the conditions imposed on secondary services with regard to causing or claiming protection from harmful interference from other services.

It is noted that passive remote sensors are detecting an increasing number of instances of interference events and the interference is distributed worldwide.

Procedures are contained in Section VI of Article 15 to address the actions to be taken when harmful interference occurs between networks authorized by different Administrations. In particular, No. 15.27 states full particulars relating to harmful interference shall, whenever possible, be given in the form indicated in Appendix 10. As Appendix 10 was designed with terrestrial radiocommunication services in mind, its applicability related to harmful interference detected by EESS (passive) sensors is very limited. Passive sensors have unique characteristics to detect the particulars of the interference using different parameters from those of stations used for radiocommunication. Administrations have approved Recommendation ITU-R RS.2106-0 which provides data fields which should be used for reporting, detection and resolution of radio frequency interference to Earth exploration-satellite service (passive) sensors.

#### Proposals

ADD TBD/XXX/1

### DRAFT NEW RESOLUTION [XXX] (WRC-19)

#### Agenda for the 2023 World Radiocommunication Conference

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

...

**X.X1** to consider implementing a mechanism in RR Appendix 10 to improve the reporting and resolution of interference to Earth exploration-satellite service passive sensors in accordance with Resolution **YYY (WRC-19)**.

Reasons: To establish a process suitable for the reporting of cases of harmful interference to Earth exploration-satellite service passive sensors which is not currently available through the existing provisions of the Radio Regulations

ADD TBD/XXX/2

## DRAFT NEW RESOLUTION [YYY] (WRC-19)

### **Reporting of harmful interference to passive sensors in the Earth exploration-satellite service**

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

*considering*

- a) that passive sensors provide information critical to maintaining and improving the accuracy of weather forecasts and climate models, which contribute to the protection of life and preservation of property throughout the world;
- b) that, in many cases, the frequencies used by Earth exploration-satellite service (passive) sensors are chosen to study natural phenomena producing radio emissions at frequencies determined by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems is not possible;
- c) that passive remote sensor operations are impaired by an increasing number of cases of interference,

*recognizing*

- a) that Section VI of Article **15** of the Radio Regulations describes the procedure for the resolution of cases of harmful interference;
- b) that data fields to be provided under the procedure of Article **15** shall, whenever possible, be given in the form indicated in RR Appendix **10**;
- c) that as Appendix **10** was designed with terrestrial services in mind, its applicability related to harmful interference detected by EESS (passive) sensors is very limited,

*further recognizing*

Recommendation ITU-R RS.2106-0 “Detection and resolution of radio frequency interference to Earth exploration-satellite service (passive) sensors” provides a reporting form for recording and reporting the radio frequency interference to Earth exploration-satellite service (passive) sensors,

*noting*

- a) that under RR No. **4.7** for the purpose of resolving cases of harmful interference, the earth exploration-satellite (passive) service shall be afforded protection from different services in other bands only to the extent that these different services are protected from each other;
- b) that RR Nos. **5.28** to **5.31** define the conditions imposed on secondary services with regard to causing or claiming protection from harmful interference from other services,

*resolves to invite the 2023 World Radiocommunication Conference*

to take into account the results of ITU-R studies, and consider the possibility of developing processes within Appendix **10** suitable for reporting cases of harmful interference to passive sensors

*invites ITU-R*

to conduct and complete, in time for WRC-23, the necessary technical and regulatory studies,

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R,

*instructs the Secretary-General*

to bring this Resolution to the attention of the World Meteorological Organization (WMO) and other international and regional organizations concerned.

**Reasons:** A resolution will support the ITU-R studies needed under the relevant WRC-23 agenda item.

SUP        TBD/XXX/3

## RESOLUTION 810 (WRC-15)

### **Preliminary agenda for the 2023 World Radiocommunication Conference**

**Reasons:** This Resolution must be suppressed, as WRC-19 will create a new Resolution that will include the agenda for WRC-23.

## ATTACHMENT

### PROPOSAL FOR ADDITIONAL AGENDA ITEM TO CONSIDER IMPLEMENTING A MECHANISM IN RR APPENDIX 10 TO IMPROVE THE REPORTING AND RESOLUTION OF INTERFERENCE TO EARTH EXPLORATION-SATELLITE SERVICE PASSIVE SENSORS

**Subject:** Proposed future WRC agenda item for WRC-23 to consider the processes for reporting and resolving harmful interference to passive sensors

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**Origin:** [TBD]

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**Proposal:** To consider implementing a mechanism in RR Appendix 10 to improve the reporting and resolution of interference to Earth exploration-satellite service passive sensors in accordance with Resolution **YYY (WRC-19)**.

**Background/reason:**

Procedures are contained in Section VI of Article 15 to address the actions to be taken when harmful interference occurs between networks authorized by different Administrations. In particular, RR No. 15.27 states full particulars relating to harmful interference shall, whenever possible, be given in the form indicated in Appendix 10. As Appendix 10 was designed with terrestrial radiocommunication services in mind, its applicability related to harmful interference detected by EESS (passive) sensors is very limited. Passive sensors have unique characteristics to detect the particulars of the interference using different parameters from those of stations used for radiocommunication. The ITU-R has approved Recommendation ITU-R RS.2106 which provides data fields which should be used for the detection and resolution of radio frequency interference to Earth exploration-satellite service (passive) sensors.

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**Radiocommunication services concerned:** Earth exploration-satellite service, fixed service, mobile service

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**Indication of possible difficulties:** None foreseen

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**Previous/ongoing studies on the issue:** ITU-R WP 7C has already developed Recommendation ITU-R RS.2106-0, Detection and resolution of radio frequency interference to Earth exploration-satellite service (passive) sensors

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<b>Studies to be carried out by:</b> WP 7C	<b>with the participation of:</b>
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**ITU-R Study Groups concerned:** SG 1, SG 5

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**ITU resource implications, including financial implications (refer to CV126):** Minimal

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<b>Common regional proposal:</b> Yes/No	<b>Multicountry proposal:</b> Yes/No
<b>Number of countries:</b>	

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**Remarks**

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## United States

### PROPOSALS FOR THE WORK OF THE CONFERENCE

#### Agenda item 10

**Agenda Item 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.

#### **Background**

WRC-15 adopted Resolution **763 (WRC 15)** to deal with stations on board suborbital vehicles. It was resolved to conduct studies during the WRC-19 study cycle:

- to identify any required technical and operational measures, in relation to stations on-board suborbital vehicles, that could assist in avoiding harmful interference between radiocommunication services.
- to determine spectrum requirements and, based on the outcome of those studies, to consider a possible future agenda item for WRC-23.

It is also noted that the ITU-R in 2015 formulated Question ITU-R 259/5, "Operational and radio regulatory aspects for planes operating in the upper level of the atmosphere", and that studies in the framework of that Question are related to Resolution **763 (WRC-15)**. In particular, decides 3 of that Question asks, "What radio links will be required to support space planes' operations and under what radiocommunication service definition will they fall?"

There are planned developments for sub-orbital flight based on various types of technologies. The approaches vary between those using a single vehicle and those that use a launch vehicle that carries the spacecraft up to an intermediate height before releasing the spacecraft to accelerate away and into a suborbital spaceflight.

The ITU-R performed a technical and operational analysis of stations on-board suborbital vehicles including an evaluation of the regulatory provisions that may require some additions or modifications and identification of the potential need for spectrum to support communications and surveillance in space, without changing the existing use of the space operations service. Link budgets and Doppler shift were studied for suborbital vehicles using existing ICAO standardized radiocommunication systems and technologies. The conclusion of the studies was that, while no new spectrum allocations are necessary, a WRC-23 agenda item is necessary to modify definitions to facilitate the increasing introduction of sub-orbital vehicles.

#### **Proposals**

ADD TBD/XXX/1

#### DRAFT NEW RESOLUTION [XXX] (WRC-19)

#### **Agenda for the 2023 World Radiocommunication Conference**

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

...

**X.X1** to consider, in accordance with Resolution [YYY] (WRC-19), regulatory provisions to facilitate the increased operation of sub-orbital vehicles.

Reasons: To allow for necessary provisions in the Radio Regulations, including, if necessary, additional spectrum allocations, definitions or revisions existing definitions to facilitate the safe integration of sub-orbital vehicles into the existing air traffic management system.

ADD TBD/XXX/2

## DRAFT NEW RESOLUTION [YYY] (WRC-19)

### **Radiocommunications for Sub-Orbital Vehicles**

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

*considering*

- a) that new applications are being developed using equipment that is interoperable with existing civil aviation systems to ensure the interoperability of sub-orbital vehicle avionics with aircraft avionics and air traffic management systems, which is necessary for the safe operation of all users of the airspace throughout the world;
- b) that there is no internationally agreed boundary between the Earth's atmosphere and the space domain, however it is commonly considered that the space domain begins at 100 kilometres above the Earth's surface;
- c) that radiocommunications for sub-orbital vehicles that are interoperable with the ATM and aircraft avionics are required throughout the entire flight trajectory to prevent collisions with aircraft,
- d) that other vehicles may also operate at altitudes over 100 km and use non-orbital trajectories,

*recognizing*

- a) that Annex 10 to the Convention on International Civil Aviation contains SARPs for aeronautical radionavigation and radiocommunication systems used by international civil aviation;
- b) that when operating radio equipment that conforms to ICAO standards while within the majority of Earth's atmosphere, radiocommunications on-board sub-orbital vehicles is similar to radiocommunications on aircraft,

*noting*

- a) that the development of compatibility criteria between ICAO-standardized aeronautical systems is the responsibility of ICAO,

*resolves to invite the 2023 World Radiocommunication Conference*

to take appropriate actions, taking into account the results of ITU-R studies,

*invites ITU-R*

to conduct studies on and identify, in time for WRC-23, any necessary revisions to the Radio Regulations to facilitate increased operation of sub-orbital vehicles. Those studies should be accomplished in close coordination with the International Civil Aviation Organization and include

defining a sub-orbital vehicle and determining appropriate radiocommunication services for flight safety applications related to interoperability with international civil aviation;

*invites administrations*

to participate actively in the studies by submitting contributions to ITU-R,

*instructs the Secretary-General*

to bring this Resolution to the attention of ICAO.

**Reasons:** A resolution will support the ITU-R studies needed under the relevant WRC-23 agenda item.

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