
PLENARY MEETING

**Addendum 15 to
Document 6146-E
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Member States of the Inter-American Telecommunication Commission (CITEL)

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.15

1.15 to consider identification of frequency bands for use by administrations for the land-mobile and fixed services applications operating in the frequency range 275-450 GHz, in accordance with Resolution **767 (WRC-15)**;

BACKGROUND

Agenda item 1.15 of the World Radiocommunication Conference 2019 (WRC-19) considers the introduction of land-mobile and fixed service applications operating in the frequency range 275-450 GHz. At present, there are no allocations to radiocommunications services above 275 GHz in the Radio Regulations (RR). However, No. **5.565** currently enables the use of the range 275-450 GHz by active and passive services on an equal basis, while inviting administrations to take all practicable steps to protect passive services.

The frequency bands included within the 275-450 GHz segment, identified for use by administrations in passive service applications, are i) 275-323 GHz, 327-371 GHz, 388-424 GHz, and 426-442 GHz for the radio astronomy service, and ii) 275-286 GHz, 296-306 GHz, 313-356 GHz, 361-365 GHz, 369-392 GHz, 397-399 GHz, 409-411 GHz, 416-434 GHz, and 439-467 GHz for the Earth exploration-satellite service (passive) and the space research service (passive). The RR allocates the 265-275 GHz frequency band to the fixed, fixed-satellite (Earth-to-space), mobile and Radioastronomy radio services for the 3 regions on a primary basis, where No. **5.149** applies.

Recent advances in microwave technology make possible the use of the frequency range 275-450 GHz by active services for communications and other uses. While optical fiber is generally the least expensive terrestrial communications medium in terms of equipment cost per Gb/s-km, there are some applications where fixed radiocommunication systems of comparable bandwidth have unique advantages. For example, in highly urbanized areas, optical fiber has very high installation costs which can greatly exceed component costs. Optical fiber cannot be installed quickly in certain place for special events and may not be economical for short-term events at a given location. Optical fiber has a time latency greater than radio systems due to the index of refraction of the fiber material which results in a group velocity about 25% less than in radio systems. While for many applications this latency is insignificant, for some applications, such as Virtual Reality (VR),

Augmented Reality (AR), automation, public safety and “mission-critical” communications, it is an issue. Finally, in case of disaster, especially earthquakes with ground rupture along a fault, fiber optics systems cannot be restored quickly and temporary radio systems with comparable capacity would be beneficial in restoring communications networks for both land line service and mobile service.

In the context of the work done by the Radiocommunication Sector of the International Telecommunication Union (ITU-R) on this agenda item, Working Party 1A (WP 1A) is responsible for directing the points established in the *invites* of Resolution **767 (WRC-15)**. In view of this, WP 1A has developed Report ITU-R [SM.2352](#) “Technological trends of active services in the frequency range 275-3.000 GHz,” which aims to provide technical information for the preparation of sharing and compatibility studies between active and passive services, and between active services.

In addition, Report [ITU-R RA.2189-1](#) (09/2018) “Sharing between the radio astronomy service and active services in the frequency range 275-3 000 GHz” concludes that sharing between radio astronomy and active services in the range 275-3 000 GHz is possible if atmospheric characteristics as a function of height above sea level, as well as transmitter antenna directivity, are taken into account. The space research service (passive) and the Earth exploration-satellite service (passive) may also be able to share frequencies with the active services; however, studies done in Report ITU-R [SM.2450](#) did not seek to develop regulatory provisions (such as power limits, shielding requirements and/or elevation angle restrictions, etc.) that could facilitate sharing with EESS and focused on identifying spectrum for LMS/FS applications, where such restrictions would not be necessary to protect the passive services. Therefore, it is possible that active service applications could share spectrum with EESS applications.

DISCUSSION

- Working Party 1A has developed a new Report ITU-R [SM.2450](#) “Sharing and compatibility studies between land-mobile, fixed and passive services in the frequency range 275-450 GHz”.
- Working Parties 5A and 5C have developed draft new ITU-R Reports outlining the technical characteristics of mobile and fixed services, respectively, above 275 GHz, which have been approved in ITU-R Study Group 5:
 - Report ITU-R [M.2417](#) “Technical and operational characteristics of the land mobile service applications operating in the frequency range 275-450 GHz”: covers close proximity mobile systems operating in the frequency bands 275–325 GHz and 275–450 GHz, including description of applications and characteristics of KIOSK downloading mobile systems, ticket gate downloading mobile systems, inter-chip communication systems, intra-device communications, and wireless links for data centers; which are all high-capacity mobile applications over short distances.
 - Report ITU-R [F.2416](#) “Technical and operational characteristics and applications of the point-to-point fixed service applications operating in the frequency band 275-450 GHz” : it is noted that the 252–275 GHz frequency range is already allocated to the fixed service and if the 275–320 GHz frequency range were to also be identified for the fixed service, a continuous 68 GHz wide band could be formed.
- The CPM text for WRC-19 agenda item 1.15, is contained in [Chapter 1 of the CPM Report](#).
- The compatibility studies between EESS(passive)/RAS and LMS/FS applications concluded that the following bands can be identified for LMS/FS applications without the need for regulatory restrictions: 275-296 GHz, 306-313 GHz, 320-330 GHz and 356-450

GHz. However, in the case where LMS/FS applications will be deployed in the same geographical area as radio-astronomy sites, separation distances and/or avoidance angles may be needed (per national arrangements) to ensure protection of radio astronomy sites from LMS/FS applications.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations

(See No. 2.1)

MOD IAP/6146A15/1

248-3 000 GHz

Allocation to services		
Region 1	Region 2	Region 3
275-3 000	(Not allocated) 5.565 ADD 5.A115	

Reasons: The land mobile service applications described in Report ITU-R M.2417 are mainly for indoor use and shielded configurations over very short distances, which will readily permit protection of the passive services using adequate shielding. The fixed service applications are for longer term use beyond at least 5 years when new technologies and sharing techniques are expected to be available, which will be able to protect the passive services. A generic identification with conditions will offer flexibility while protecting EESS (passive) and RAS.

ADD IAP/6146A15/2

5.A115 For the operation of fixed and land mobile service applications:

In the frequency bands 275-296 GHz, 306-313 GHz, 320-330 GHz and 356-450 GHz, no specific conditions are necessary on fixed and land mobile service applications to protect Earth exploration-satellite service (passive) applications.

In the frequency bands 275-323 GHz, 327-371 GHz, 388-424 GHz and 426-442 GHz, depending on the case, it may be necessary to adopt specific conditions (e.g. minimum separation distances and/or avoidance angles) to ensure the protection of radio astronomy stations from fixed and land mobile service applications.

In the frequency bands 296-306 GHz, 313-320 GHz, 330-356 GHz, specific conditions are necessary (such as shielding) in order to ensure the protection of Earth exploration-satellite service (passive) applications from fixed and land mobile service applications.

When applying this provision, administrations should take into account the results of relevant ITU studies.

This footnote does not establish priority or preclude the use of 275-450 GHz by these or other services. (WRC-19)

Reasons: The ITU-R studies on the compatibility of passive and active services have shown that, depending on the specific sub-band of the 275-450 GHz frequency range and combination of active/passive service application combination, coexistence can be achieved either without needing specific conditions or with the implementation of mitigation techniques such as minimum separation distances and avoidance angles. Adequate shielding has not been ruled out as an

effective mitigation technique to protect EESS. ITU-R Recommendations and Reports on coexistence between active and passive service applications are expected to evolve over time to reflect technological developments.

NOC IAP/6146A15/3

5.565 The following frequency bands in the range 275-1 000 GHz are identified for use by administrations for passive service applications:

- radio astronomy service: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz;
- Earth exploration-satellite service (passive) and space research service (passive): 275-286 GHz, 296-306 GHz, 313-356 GHz, 361-365 GHz, 369-392 GHz, 397-399 GHz, 409-411 GHz, 416-434 GHz, 439-467 GHz, 477-502 GHz, 523-527 GHz, 538-581 GHz, 611-630 GHz, 634-654 GHz, 657-692 GHz, 713-718 GHz, 729-733 GHz, 750-754 GHz, 771-776 GHz, 823-846 GHz, 850-854 GHz, 857-862 GHz, 866-882 GHz, 905-928 GHz, 951-956 GHz, 968-973 GHz and 985-990 GHz.

The use of the range 275-1 000 GHz by the passive services does not preclude use of this range by active services. Administrations wishing to make frequencies in the 275-1 000 GHz range available for active service applications are urged to take all practicable steps to protect these passive services from harmful interference until the date when the Table of Frequency Allocations is established in the above-mentioned 275-1 000 GHz frequency range.

All frequencies in the range 1 000-3 000 GHz may be used by both active and passive services. (WRC-12)

Reasons: Studies have shown that sharing is feasible between applications of the LMS/FS and EESS (passive)/RAS without conditions in parts of the 275-450 GHz range. Studies also show that LMS/FS and RAS applications can coexist in other parts of the range with conditions.

For the frequency ranges where EESS operates, sharing can be achieved by ensuring that transmissions from LMS/FS applications do not impact the sensitive EESS receivers through appropriate mitigation measures.

Considering that the 275-450 GHz range is already available for use by all active services on a best effort basis the proposed additional footnote will provide stronger protection to passive services while keeping the balance between all active and passive service applications that can use this frequency range where there are no service allocations.

Beyond the measures that can be taken at this time to achieve sharing, technology evolution and deployment conditions may further facilitate sharing. Such conditions can continue to be studied in ITU-R to provide additional guidance.

SUP IAP/6146A15/4

RESOLUTION 767 (WRC-15)

Studies towards an identification for use by administrations for land-mobile and fixed services applications operating in the frequency range 275-450 GHz

The World Radiocommunication Conference (Geneva, 2015),

Reasons: The studies can continue in ITU-R without the need for a WRC Resolution and the results published in ITU-R Recommendations and Reports.