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| A close up of a sign  Description automatically generated | **World Radiocommunication Conference (WRC-23) Dubai, 20 November - 15 December 2023** | |  |
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| PLENARY MEETING | | **Revision 1 to Document 201-E** | |
|  | | **19 November 2023** | |
|  | | **Original: English** | |
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| Samoa (Independent State of) | | | |
| Proposals for the work of the Conference | | | |
|  | | | |
| Agenda item 1.2 | | | |

1.2 to consider identification of the frequency bands 3 300-3 400 MHz, 3 600‑3 800 MHz, 6 425-7 025 MHz, 7 025-7 125 MHz and 10.0-10.5 GHz for International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis, in accordance with Resolution **245 (WRC‑19)**;

# 1 Background

This input contribution is submitted under WRC-23 agenda item 1.2 in relation to the measures required for the protection of existing unplanned and planned services in Band 4 (6 425-7 025 MHz (Region 1)) and Band 5 (7 025-7 125 MHz (globally)) given possible IMT identifications in these bands.

The bands consist of unplanned fixed-satellite services (FSS), allocated on a co-primary basis and a planned band under Appendix **30B** of the Radio Regulations (RR), providing in particular less developed countries (LDCs) and Small Island Developing States (SIDs) with equitable access to the geostationary orbit. In addition, these frequency bands are already allocated to the mobile service on a primary basis. Several administrations have made the frequency band 5 925-7 125 MHz or portions of it available for unlicensed use, such as Wireless Access Systems/Radio Local Area Network (WAS/RLAN). Sharing the frequency bands with incumbent services, such as the fixed service (FS) and FSS, could be feasible by allowing appropriate regulatory and technical conditions.

Therefore, it is recognized that the current provisions of the frequency band 6 425-7 125 MHz in the RR provide appropriate conditions for existing services to share the frequency bands, including between FSS and WAS/RLAN. However, in the case of IMT identification in this band, additional measures are necessary to protect the RR Appendix **30B** band and the band used for other critical, safety-related FSS applications, including feeder uplinks used by mobile-satellite service (MSS) systems.

The co-signing administrations continue to utilize existing services, such as C-band FSS, MSS, WAS/RLAN, etc., as a vital component of their national telecommunication infrastructure today and well into the future. For both LDCs and SIDs, the C-band satellite use, with its unique characteristics, including resistance to rain fade and wide reach, will continue to serve these countries, especially given the impact of climate change, with increased frequency and severity of cyclones, floods, drought and other widespread destruction. The characteristics of the C-band have also led to the use of this band for feeder uplinks for MSS systems, including those providing safety-related services. Ships and aircraft operating throughout the Pacific region rely on the availability of Band 4 for feeder links for safety-related information.

Furthermore, unlicensed use, such as WAS/RLAN in the adjacent band below and within this frequency band, would facilitate bridging the digital divide, given that a significant percentage of the population lives in rural and remote areas throughout the Pacific Islands.

These administrations, in formulating their position on the measures, have taken into consideration the following factors:

1 As per the CPM Report, the findings from the studies conducted during this cycle have used varying assumptions, parameters and methodology, resulting in findings showing a wide range of interference levels to satellite receivers. Therefore, a cautious approach is required when considering measures to protect existing services, including FS and FSS.

2 The studies on FSS considered both planned and unplanned bands.

3 Co-signing administrations intensely desire to preserve the sanctity of RR Appendix **30B** for the use of national satellite programs and to bridge the digital divide. If Bands 4 and 5 are used for IMT, then restrictive measures would be vital to protecting the existing services.

4 There is an intense desire from co-signing administrations to preserve the provisioning of existing safety services utilizing both C and L bands for national emergencies/disasters, maritime and aeronautical services in compliance with IMO and ICAO requirements, as well as for national and regional rescue coordination operations particularly serving the Pacific region.

5 The need for flexibility in using this spectrum by existing multiple stakeholders and to use this band for IMT without impacting the existing 6 GHz ecosystem requires a new Resolution and a footnote with appropriate conditions and measures as outlined below.

6 It is worth noting that the ITU-R is working on revising Recommendation ITU-R M.1801-2 – *Radio interface standards for broadband wireless access systems, including mobile and nomadic applications, in the mobile service*. This Recommendation includes multiple access technologies that may be used to provide broadband wireless access systems under the mobile service in the upper 6 GHz band.

7 Many countries have already decided that the upper 6 GHz band will be used in their administrations for WAS/RLAN systems rather than IMT.

The co-signing administrations support no change; however, recognizing that some countries may wish to identify the frequency band 7 025-7 125 MHz for IMT, then the necessary conditions and measures as outlined below should be taken into consideration as part of any new WRC Resolution and footnote.

# 2 Proposals

The following proposals would implement IMT identification as described.

ARTICLE 5

Frequency allocations

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

NOC SMO/201/1#1363

5 570-6 700 MHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 5 925-6 700 FIXED 5.457  FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B  MOBILE 5.457C  5.149 5.440 5.458 | | |

**Reasons:** Based on current and planned developments by other services, widespread use of this band for IMT is not feasible.

MOD SMO/201/2#1372

6 700-7 250 MHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 6 700-7 075 FIXED  FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441  MOBILE ADD 5.XXX  5.458 5.458A 5.458B | | |
| 7 075-7 145 FIXED  MOBILE ADD 5.XXX  5.458 5.459 | | |

**Reasons:** Based on current and planned developments by other services, widespread use of the frequency band 6 700-7 025 MHz for IMT is not feasible. For the frequency band 7 025-7 125 MHz, some administrations may wish to consider IMT identification through a new footnote.

ADD SMO/201/3#1373

5.XXX In [country #1], [country #2 etc.], the frequency band 7 025-7 125 MHz is identified for use by administrations wishing to implement the terrestrial component of International Mobile Telecommunications (IMT). This identification does not preclude using this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. Resolution**[A12-6GHz] (WRC‑23)** applies.     (WRC‑23)

**Reasons:** Some technical studies have shown that IMT networks may cause interference to existing services in the frequency band 7 025-7 075 MHz. Therefore, IMT network deployment must be managed per the conditions outlined in the new Resolution below to ensure coexistence with ongoing incumbent operations in the frequency band 7 025-7 125 MHz.

ADD SMO/201/4#1370

draft new Resolution [A12-6GHz] (WRC‑23)

**Terrestrial component of International Mobile Telecommunications in the frequency band 7 025-7 125 MHz**

The World Radiocommunication Conference (Dubai, 2023),

considering

*a)* that International Mobile Telecommunications (IMT), including IMT‑2000, IMT‑Advanced and IMT‑2020, is the ITU vision of global mobile access and is intended to provide telecommunication services on a worldwide scale, regardless of location and type of network or terminal;

*b)* that harmonized worldwide frequency bands for IMT are desirable in order to achieve global roaming and the benefits of economies of scale;

*c)* that identification of frequency bands allocated to the mobile service for IMT may change the sharing situation regarding applications of services to which the frequency band is already allocated and may require regulatory actions;

*d)* that the ITU Radiocommunication Sector (ITU‑R) has studied, in preparation for WRC‑23, sharing and compatibility with services allocated in the frequency bands 6 425-7 025 MHz and 7 025-7 125 MHz, and its adjacent band, as appropriate, based on characteristics available at that time, and results may change if these characteristics change;

*e)* that the frequency band 6 425-7 125 MHz, or part thereof, is allocated on a primary basis to the fixed, mobile, fixed-satellite (Earth-to-space and space-to-Earth) and space operation services (Earth-to-space),

noting

*a)* Resolutions **223 (Rev.WRC‑19)**, **224 (Rev.WRC‑19)**, **225 (Rev.WRC‑12)**, **241 (WRC‑19)**, **242 (WRC‑19)** and **243 (WRC‑19)**, which also relate to IMT;

*b)* that the IMT terrestrial radio interfaces, as defined in Recommendations ITU‑R M.1457, ITU‑R M.2012 and ITU‑R M.2150, are expected to evolve within the framework of ITU‑R beyond those initially specified to provide enhanced services and services beyond those envisaged in the initial implementation;

*c)* that ITU‑R has developed its vision defining the framework and overall objectives of IMT towards 2030 and beyond to drive the future developments for IMT,

recognizing

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,

resolves

1 that administrations identified in No. **5.XXX** wishing to implement IMT consider the use of the frequency band 7 025-7 125 MHz, taking into account the latest relevant ITU‑R Recommendations;

2 that administrations wishing to implement IMT in the frequency band 7 025-7 075 MHz shall apply the following conditions to IMT to ensure the protection, continued use and future development of the fixed-satellite service (Earth-to-space):

2.1 practical measures shall be applied to ensure the transmitting antennas of outdoor base stations are normally pointing below the horizon when deploying IMT base stations within the frequency band 7 025-7 075 MHz; the mechanical pointing needs to be at or below the horizon;

2.2 the level of expected equivalent isotropically radiated power (e.i.r.p.) emitted by an IMT base station as a function of vertical angle above the horizontal in the frequency band 7 025-7 075 MHz or part thereof shall not exceed the following values:

|  |  |
| --- | --- |
| Vertical angle measurement window  θ*L ≤* θ *<* θ*H*  (vertical angle θabove horizon) | Expected e.i.r.p.  (dBm/MHz)  (NOTES 1, 2, 3, 4) |
| 0° ≤θ < 5° | 6.4 |
| 5° ≤θ< 10° | –0.7 |
| 10° ≤ θ< 15° | –4.3 |
| 15° ≤ θ < 20° | –6.4 |
| 20° ≤ θ < 30° | –9.2 |
| 30° ≤ θ < 60° | –13.8 |
| 60° ≤ θ≤ 90° | –20.7 |
| NOTE 1: The expected e.i.r.p. is defined as the mathematical expectation (i.e. an averaging) of the e.i.r.p:  – over horizontal angles between –180° to +180°, and the IMT base station beamforming in a specific direction within its steering range;  – over different beamforming directions within the IMT base station steering range; and  – over the specified vertical angle measurement window (θ*L*≤θ<θ*H*).  NOTE 2: An IMT base station must comply with the specified limits on expected e.i.r.p. for all mechanical tilts with which it can be deployed.  NOTE 3: For calculation of expected e.i.r.p., the beamforming directions used in the averaging process have a uniform angular distribution within the steering range of the IMT base station.  NOTE 4: See the Annex of this Resolution for further requirements related to the determination of the expected e.i.r.p. | |

2.3 The following limit to the e.i.r.p. radiated by each IMT base station, in any bandwidth of 1 MHz, for a given elevation angle above the horizontal applies:

e.i.r.p. limits for IMT base stations

| Elevation angle (θ) degrees | **Maximum e.i.r.p.  dBW/100 MHz** |
| --- | --- |
| 0 ≤ θ ≤ 1 | 30.7 |
| 1 < θ ≤ 10 | 30.7 – 1.777(θ – 1) |
| 10 < θ ≤ 90 | 14.7 – 0.239(θ – 10) |

3 that IMT within the frequency range 7 025-7 075 MHz shall not be used by aeronautical applications,

invites the ITU Radiocommunication Sector

1 to develop frequency arrangements to facilitate IMT deployment in the frequency band 7 025-7 125 MHz in Region 1, given the conditions as outlined within this Resolution;

2 to continue to provide guidance to ensure that IMT can meet the telecommunication,

instructs the Director of the Radiocommunication Bureau

to bring this Resolution to the attention of relevant international organizations.

Annex to Resolution [A12-6GHz] (WRC‑23)

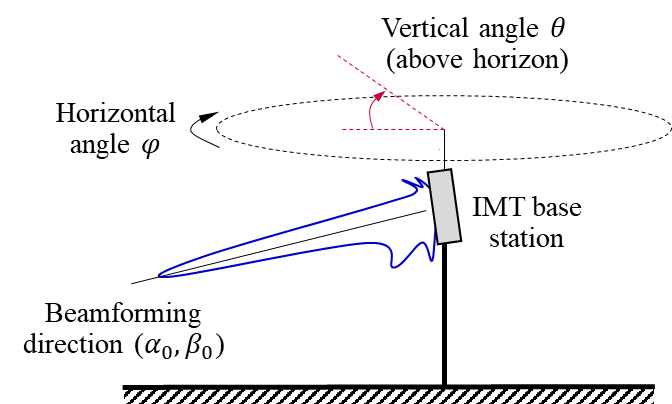
Calculation of the expected e.i.r.p. of an IMT base station

The following outlines the calculation of the expected e.i.r.p. of an IMT base station for assessing the compliance of IMT base station equipment with the limit on expected e.i.r.p.

The e.i.r.p. of an IMT base station in the horizontal (azimuth) direction −π ≤ φ ≤ π and vertical (elevation) direction 0 ≤ θ ≤ π/2 above the horizon can be written as *P*(θ, φ; α, β). The parameters α and β are the horizontal and vertical beamforming directions, i.e. the angles towards which the base station electronically steers a beam. These are illustrated in Figure 1 below.

Figure 1

Illustration of horizontal (azimuth) angle, vertical (elevation) angle   
and beamforming directions



The expected e.i.r.p.  of an IMT base station within a vertical angle measurement window θ*L*≤ θ < θ*H*  can be calculated by averaging the e.i.r.p. *P*(θ, φ; α, β) of the base station as follows:

**1 Averaging over beamforming directions for a given vertical angle θ0 and horizontal angle φ0:**

a) **For an AAS base station within a given steering range**,a sufficient sampling of beamforming directions (α*n*, β*n*) n = 1...*N* is necessary to allow an accurate averaging of the expected e.i.r.p.

The beamforming directions (α*n*, β*n*) have a uniform angular distribution within the steering range of the IMT base station. In other words:



where *wn* refers to the weight for the *n*th beamforming direction, i.e., the fraction of the steering range represented by the *n*th beamforming direction.

b) **For a non-AAS base station**, *P*1(θ0, φ0) = *P*(θ0, φ0; α1, β1) where α1 = 0 and β1 is the electrical tilt.

It is noted that the compliance with the limits on expected e.i.r.p. could be limited to a given range of electrical tilts.

**2 Averaging over horizontal and vertical angles** – The expected e.i.r.p. is then calculated by averaging the results of step (1) over horizontal angles φ between −π to +π with respect to the base station horizontal boresight, and vertical angles θ within vertical angle measurement window θ*L*≤ θ < θ*H*  with respect to the horizon. In other words:

**

Steering ranges and electrical tilt ranges over which the AAS is compliant must be declared and the IMT equipment shall be operated with beam pointing only within the declared steering range, and with electrical tilt only within the declared range.

The assessment shall be conducted with the base station transmitting with maximum power with all resource blocks occupied.

The assessment shall be conducted with the base station, e.i.r.p. measured as the sum of both polarizations, with no polarization discrimination applied.

**Reasons:** To support the development of IMT in those countries wishing to identify Band 5 covering the frequency band 7 025-7 125 MHz with the necessary conditions to protect the existing FSS services.

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