**3GPP TSG RAN meeting #103 Revised RP-240274**

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**Source:** Ericsson, Apple

**Title:** TP to TR 37.890 – WRC-23 outcomes

**Agenda item:** 9.2.1

**Document for:** Approval

# Introduction

The RAN-led study item on 6 GHz band for LTE and NR captures the latest status of Regulators decision for the 6 GHz frequency range.

This contribution is capturing WRC-23 outcomes on the upper 6 GHz frequency band.

# Text proposal

<Start of changes>

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

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## 4.0 General

The Mobile allocation in the frequency range 5.925-7.125 GHz, which is allocated at International level to Mobile services on a primary basis in all Regions, as per ITU Table of frequency allocation [3] summarized in Table 4.0-1, has not yet been implemented at National level in most countries. On the contrary, this frequency range is already used by several services which may impose constraints on any new users.

Table 4.0-1: ITU allocation to services in 5.925-7.145 GHz

|  |  |
| --- | --- |
| Frequency range [MHz] | Allocations |
| Region 1 | Region 2 | Region 3 |
| 5 925 - 6 700 | FIXED 5.457FIXED SATELLITE (Earth-to-space) 5.457A 5.457BMOBILE 5.457C5.149 5.440 5.458 |
| 6 700 - 7 075 | FIXEDFIXED SATELLITE (Earth-to-space) (space-to-Earth) 5.441MOBILE5.458 5.458A 5.458B |
| 7 075 – 7 145 | FIXED MOBLE5.458 5.459 |

The FCC notice of proposed rulemaking is available in [25].

The CEPT 5925-6425 MHz regulatory requirements are available in [34].

## 4.0a WRC-23

WRC-23 (20 November - 15 December 2023) approved Resolution COM4/7 [82], adding the footnotes 5.6A12, 5.6B12 and 5.6C12 to frequency ranges 5 925-6 700 MHz, 6 700-7 075 MHz and 7 075-7 145 MHz, as shown in Figure 4.4-1.



Figure 4.4-1: Radio Regulations updates approved in WRC-23

With the following footnotes:

* **5.6A12** The frequency bands 6 425-7 125 MHz in Region 1 and 7 025-7 125 MHz in Region 3 are identified for use by administrations wishing to implement the terrestrial component of International Mobile Telecommunications (IMT). This identification does not preclude the use of these frequency bands by any application of the services to which they are allocated and does not establish priority in the Radio Regulations. Resolution **COM4/7 (WRC-23)** applies.

The frequency bands are also used for the implementation of wireless access systems (WAS), including radio local area networks (RLANs). (WRC-23)

* **5.6B12** In Cambodia, Lao P.D.R. and the Maldives, the frequency band 6 425-7 025 MHz is identified for 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 it is allocated and does not establish priority in the Radio Regulations. Resolution **COM4/7 (WRC-23)** applies. (WRC-23)
* **5.6C12** In Brazil and Mexico, the frequency band 6 425-7 125 MHz is identified for the terrestrial component of International Mobile Telecommunications (IMT). The use of this frequency band for the implementation of IMT is subject to seeking agreement under No. **9.21** with neighbouring countries. This identification does not preclude the use of this frequency band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations. Resolution **COM4/7 (WRC‑23)** applies.

The frequency band is also used for the implementation of wireless access systems (WAS), including radio local area networks (RLANs). (WRC-23)

The Resolution COM4/7 [82] resolves that, when implementing IMT:

* In order to ensure protection of FSS (Earth-to-space), the level of expected EIRP spectral density emitted by an IMT base station as a function of the vertical angle above the horizon shall not exceed the values specified in Table 4.4-1.

Table 4.4-1: EIRP density mask

|  |  |
| --- | --- |
| Vertical angle rangeθ*L* ≤ θ < θ*H*(vertical angle θ above horizon) | Expected EIRP (dBm/MHz) (See NOTES 1, 2 and 3) |
| 0° ≤ θ < 5° | 27 |
| 5° ≤ θ < 10° | 23 |
| 10°≤ θ < 15° | 19 |
| 15°≤ θ < 20° | 18 |
| 20°≤ θ <30° | 16 |
| 30°≤ θ < 60° | 15 |
| 60°≤ θ ≤ 90° | 15 |
| NOTE 1: The expected EIRP is defined as the average value of the EIRP, with the averaging being performed: ‒ over horizontal angles from −180° to +180°, with the IMT base station beamforming in a specific direction within its horizontal and vertical steering range,  ‒ over different beamforming directions within the IMT base station horizontal and vertical steering range, and ‒ over the specified vertical angle range θL ≤ θ < θH.NOTE 2: An IMT base station shall comply with the specified limits on expected EIRP spectral density for all mechanical tilts with which it can be deployed, taking into account considering m).NOTE 3: The Annex to the Resolution COM 4/7 [82] provides additional details on how the expected EIRP can be calculated for this frequency band, see Annex A. |

* Administrations wishing to implement IMT in the frequency band 6 700-7 075 MHz shall - ensure the protection, continued use and future development of FSS (space-to-Earth) stations through the adoption of site-specific coordination.

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#### 4.1.1.3 Unlicensed operations

##### 4.1.1.3.0 Background

In December 2017, EC Radio Spectrum Committee finalized the Mandate to CEPT [21] to study and identify harmonised compatibility and sharing technical conditions for a sustainable and efficient use on a shared basis of the frequency range 5.925-6.425 GHz for Wireless Access Systems including Radio Local Area Networks (WAS/RLANs).

CEPT created two project teams, ECC SE 45 (coexistence) and ECC FM 57 (regulatory). ECC SE 45 was tasked to undertake compatibility and sharing studies in the 5.925-6.425 GHz frequency range to support ECC FM 57, and the latter defined the regulatory rules for the band. The scope of the work items in these groups was the introduction of low power wireless access systems (including RLAN) in the frequency range 5.925-6.425 GHz under a licence-exempt / general authorisation regulatory regime, ensuring certainty of continued operation, development and protection of existing services (Fixed Services (FS), Fixed Satellite Service (FSS)) considering RR 5.440 and 5.458.

ETSI has published the TR 103 524 [22] providing information on the technical parameters for WAS/RLANs to support the CEPT Work Items activities covering the frequency range 5.925 GHz to 6.425 GHz. In addition, it contains a request for considering additional frequencies up to 6.725 GHz. Furthermore, ETSI published TR 103 631 [27] providing information on the intended applications, the technical parameters, mitigation techniques, the relation to the existing spectrum regulation and additional new radio spectrum requirements for technology neutral wireless access systems including radio local area networks (WAS/RLANs) capable of operating in the 6725 MHz to 7125MHz range.

The ECC Report 302 [24] on sharing and compatibility studies related to Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) in the frequency band 5925-6425 MHz, developed by ECC SE45, used the technical characteristics specified in the ETSI TR 103 524 [22] for RLAN as starting point, and the technical parameters provided from ECC SE19 and ECC SE40 for FS and FSS respectively. It is to be noted that some of the technical parameters (for example max EIRP, TX unwanted emissions, etc.) for RLAN in the ETSI TR 103 524 may differ from the final rules for the band, depending on the results of the compatibility studies done by CEPT.

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Annex A: Annex to Resolution COM4/7 (WRC-23)

The EIRP 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 A-1 below.



Figure A-1: Illustration of horizontal (azimuth) angle, vertical (elevation) angle and beamforming directions

The expected EIRP  of an IMT base station within a vertical angle range θ*L* ≤ θ < θ*H* can be calculated by averaging the EIRP *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**: for an AAS base station within a given horizontal and vertical steering range,** a sufficient sampling of *N* beamforming directions (α*n*, β*n*) *n*= 1 ... *N* is necessary to allow an accurate averaging of the expected EIRP.

 The beamforming directions (α*n*, β*n*) have a uniform statistical 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. For example, *wn* = 1/*N* in the case that *N* uniform equispaced beams are assumed in the azimuth and elevation, respectively, and where each beam covers an equal range of angles.

 The set of base station configurations over which the base station complies with the limits on expected EIRP (for example, power of steering range as one of the parameters) shall be declared and the BS shall be used within one of these configurations.

 The set of EIRP values used to calculate the expected EIRP for each vertical angle range shall be a mathematical summation of both polarization states of the IMT base station antenna with no polarization discrimination.

 **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 EIRP should be limited to a defined range of electrical tilts.

**2) Averaging over horizontal and vertical angles**: the expected EIRP is then calculated by averaging the results of step 1 over horizontal angles φfrom −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:

 

The averaging processes in steps 1 and 2 shall allow for accurate averaging of the expected EIRP (e.g. to the confidence interval of 95%).

Annex B: Change history

<End of changes>