Results of WRC-23

Training Workshop on Radio Frequency matters
for the Asia-Pacific Region

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Agenda item 1.2

Identification of new frequency bands for IMT: 3300-3400 MHz, 3600-3800 MHz, **6425-7025 MHz, 7025-7125** MHz and **10.0-10.5** GHz.

WMO interests:

- Sea surface temperature (SST) measurements are performed in the 6425–7075 MHz and 7075–7250 MHz frequency bands. Measurements essential in the knowledge and prediction of tropical cyclones, climate monitoring, improvement of Numerical Weather Prediction,…
- EESS (active) protection in the 10.0–10.4 GHz frequency band.
- EESS (passive) protection in the 10.6–10.7 GHz frequency band.

WRC-23 decision for the purposes of SST:

- New WRC-27 Agenda Item 1.19 (New EESS (passive) allocations in the 4.2-4.4 GHz and 8.4-8.5 GHz)

WRC-23 decision for the purposes of protecting the EESS (passive):

- the total radiated power (TRP) produced per IMT base station and by IMT user equipment operating in the frequency band 10-10.5 GHz shall not exceed respectively −37.9 dB(W/100 MHz) and −39 dB(W/100 MHz) in the frequency band 10.6-10.7 GHz;
- IMT stations within the frequency range 10-10.5 GHz shall be used only for applications of the land mobile service.

WRC-23 decision to ensure the protection of EESS (active):

- that administrations shall take practical measures to ensure that transmitting antennas of outdoor base stations are normally pointing below the horizon when deploying IMT base stations within the frequency band 10-10.5 GHz; the mechanical pointing needs to be at or below the horizon;
- that the maximum equivalent isotropically radiated power (e.i.r.p.) per base station shall not exceed 30 dB(W/100 MHz) and that the maximum e.i.r.p. per base station for elevation angles higher than 34 degrees shall not exceed 0.5 dB(W/100 MHz);

Agenda item 1.4

to consider, in accordance with Resolution 247 (WRC-19), the use of high-altitude platform stations as IMT base stations (HIBS) in the mobile service in certain frequency bands below 2.7 GHz already identified for IMT, on a global or regional level

WMO interests:

- Protection of MetSat systems in the 1675–1710 MHz band => HIBS operations in the 1710–1785 MHz band would have to be limited to the uplink direction (HIBS receiving from IMT UE).
- Protection of EESS and SOS in the 2025–2110 MHz band => HIBS operations in the 2110–2170 MHz band would have to be limited to the downlink direction (HIBS transmitting to ground-based UE).
- protection of meteorological radar in the 2700–2900 MHz band by appropriate regulatory provisions for HIBS operations in the 2500–2690 MHz band.

WRC-23 decision for the purposes of protecting the MetSat, EESS and SOS :

Footnote **RR 5.388A** : Such use of HIBS in the frequency bands 1 710-1 785 MHz in Regions 1 and 2, and 1 710-1 815 MHz in Region 3 is limited to reception by HIBS, and in the frequency band 2 110-2 170 MHz is limited to transmission from HIBS.

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WRC-23 decision to ensure the protection of radars:

The pfd level per HIBS operating in the frequency band 2 500-2 690 MHz produced at the surface of the Earth in the territory of other administrations shall not exceed the following unwanted emissions limit, unless explicit agreement of the affected administration is provided:

-165.6 dB(W/(m2 · MHz)) for $\theta \leq 37°$

$-165.6 + 5.5\ (\theta - 37°)$ dB(W/(m2 · MHz)) for $37° < \theta < 45°$

$-121.6 + (\theta - 45°) / 3$ dB(W/(m2 · MHz)) for $45° < \theta \leq 90°$

where θ is the angle of arrival of the incident wave above the horizontal plane, in degrees.

Agenda item 1.7

to consider a new aeronautical mobile-satellite (R) service allocation in accordance with Resolution 428 (WRC 19) for both the Earth-to-space and space-to-Earth directions of aeronautical VHF communications in all or part of the frequency band 117.975-137 MHz, while preventing any undue constraints on existing VHF systems operating in the aeronautical mobile (R) service, in the aeronautical radionavigation service, and in adjacent frequency bands

WMO interests:

- the protection of SOS (space-to-Earth), SRS (space-to-Earth) and MetSat (space-to-Earth) operated in the adjacent 137-138 MHz frequency band is ensured from unwanted emissions of this new AMS(R)S
- no additional constraint is made to the SOS (space-to-Earth), SRS (space-to-Earth) and MetSat (space-to-Earth) services to ensure the protection of this new AMS(R)S allocation.

WRC-23 decision for the purposes of protecting the SOS (space-to-Earth), SRS (space-to-Earth) and MetSat (space-to-Earth:

New AMS(R)S allocation in the 117.975 – 137 MHz band with out-of-band emissions limit in the band 137 - 138 MHz to protect the SRS, SOS and MetSat allocations

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Agenda item 1.10

to conduct studies on spectrum needs, coexistence with radiocommunication services and regulatory measures for possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications, in accordance with Resolution **430 (WRC 19)**

WMO interests:

- Protection of EESS (passive) operating in the band 22.21–22.5 GHz from the AM(OR)S by appropriate unwanted emission limit (-23 dBW per 100 MHz) to new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications.

WRC-23 decision for the purposes of protecting the SOS (space-to-Earth), SRS (space-to-Earth) and MetSat (space-to-Earth:

Footnote **RR 5.531F :** In order to protect stations of the Earth exploration-satellite service (passive) operating in the frequency band 22.21-22.5 GHz, the unwanted equivalent isotropically radiated power (e.i.r.p.) of stations operating in the aeronautical mobile (OR) service shall not exceed −23 dBW in any 100 MHz band in the frequency band22.21-22.5 GHz. (WRC-23)

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Agenda item 1.12

to conduct, and complete in time for WRC-23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for space-borne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with Resolution **656 (Rev. WRC-19)**

WMO interests:

- support a new secondary allocation to EESS (active) in the 40–50 MHz frequency band with appropriate protection being provided to wind profiler radars under **No 5.162A** and oceanographic radars under **No 5.161A**

WRC-23 decision :

Footnote **RR 5.159A** : The use of the frequency band 40-50 MHz by the EESS (active) shall be in accordance with the geographical area restrictions and the operational and technical conditions defined in Resolution **677 (WRC-23)**.

Resolution **677 (WRC-23)**:

- Operations within the polar regions subject to:

  The mean power flux density (pfd) limit shall not exceed:
  - −147 dB(W/(m2 · 4 kHz)), under clear sky propagation conditions, for more than 0.05% of the time within a 24-hour period
  - −136 dB(W/(m2 · 4 kHz)), under clear sky propagation conditions.

  Transmission time limited to no more than 90 minutes per 24-hour period.
- Operations outside the polar regions subject to:

  The pfd level per spaceborne radar sounder produced at the surface of the Earth shall not exceed −189 dB(W/(m2 · 4 kHz)), under free-space propagation conditions

  The pfd may be exceeded over the territory of any administration subject to obtaining explicit agreement from that administration.

- No claim for protection from the secondary allocations to the radiolocation service within the 40-50 MHz range.
- Coordination between EESS (active) systems and wind profiler radars in the 40-50 MHz band on a case-by-case basis

Agenda item 1.13

to consider a possible upgrade of the allocation of the frequency band 14.8–15.35 GHz to the space research service, in accordance with Resolution **661 (WRC-19)**

WMO interests:

- Not opposed to the upgrade of the existing SRS secondary allocation in 14.8–15.35 GHz to primary status.

WRC-23 decision :

Footnote **RR 5.510A** : The allocation of the frequency band 14.8-15.35 GHz to the space research service on a primary basis is limited to satellite systems operating in the space-to-space, space-to-Earth and Earth-to-space directions at distances from the Earth of less than 2×10^6 km in accordance with Resolution **678 (WRC-23)**. Other uses of the frequency band by the space research service are on a secondary basis. The use of the frequency band 14.8-15.35 GHz by the space research service (space-to-Earth) (Earth-to-space) is on a secondary basis with respect to the terrestrial services in Algeria, Saudi Arabia, Bahrain, Korea (Rep. of), Egypt, the United Arab Emirates, the United States, India, Iraq, Japan, Kuwait, Libya, Morocco, Mauritania, Oman, Qatar, the Syrian Arab Republic, Tunisia and Yemen. (WRC-23)

Resolution **678 (WRC-23)**:

- conditions shall apply to the SRS in the frequency band 14.8 15.35 GHz for the purpose of protecting in-band and adjacent-band services.

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Agenda item 1.14

to review and consider possible adjustments of the existing or possible new primary frequency allocations to EESS (passive) in the frequency range 231.5–252 GHz, to ensure alignment with more up-to-date remote sensing observation requirements, in accordance with Resolution **662 (WRC-19)**

WMO interests:

- supports new primary allocations to EESS (passive) in the frequency bands 239.2–242.2 GHz and 244.2–247.2 GHz in order to accommodate the requirements for ice cloud measurements.

WRC-23 decision :

- New primary worldwide allocations for EESS (passive) in the bands 239.2-242.2 and 244.2-247.2 GHz
- To ensure protection of EESS (passive), fixed and mobile services allocations in the band 239.2-241 GHz were shifted to 235-238 GHz
- New footnote RR No. 5.563AA : In the frequency band 235-238 GHz, stations in the Earth exploration-satellite service (passive) shall not claim protection from stations in the fixed and mobile services. (WRC-23)

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Agenda items 1.16 and 1.17

1.16 : to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7–18.6 GHz and 18.8–19.3 GHz and 19.7–20.2 GHz (space-to-Earth) and 27.5–29.1 GHz and 29.5–30 GHz (Earth-to-space) by non-GSO FSS ESIMs, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution **173 (WRC-19)**

1.17 : to determine and carry out, on the basis of the ITU-R studies in accordance with Resolution **773 (WRC-19)**, the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate

WMO interests:

- protection of the EESS (passive) in the band 18.6–18.8 GHz.
- supports the implementation of regulatory provisions which would ensure that the operation of satellite-to-satellite links will not lead to increased interference to the EESS (passive) in the band 18.6–18.8 GHz

WRC-23 decision :

- limits on non-GSO FSS transmitting to ESIMs (Resolution **123 (WRC-23)**) in 17.7-18.6 and 18.8-19.3 GHz
- limits on the Inter-Satellite Service (Resolution **679 (WRC-23)**): unwanted emission PFD limits in the 18.6-18.8 GHz

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Agenda item 4

in accordance with Resolution 95 (Rev.WRC-19), to review the Resolutions and Recommendations of previous conferences with a view to their possible revision, replacement or abrogation

WMO interests:

- with regards to Resolution **731 (Rev. WRC-19)**, WMO supports a revision of this WRC Resolution to clarify that in-band sharing studies cannot be performed in bands covered by RR No. 5.340.

WRC-23 decision :Revision of Resolution **731 (Rev. WRC-19)**

- deletion of frequency bands covered by footnote **RR No. 5.340** in invites 1 of the Resolution
- to study under what conditions passive services operating in allocated frequency bands 100-102 GHz, 148.5-151.5 GHz, 182-185 GHz, 190-191.8 GHz and 226-231.5 GHz are compatible with active services allocated to adjacent bands.

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Agenda item 9.1 - Topic a

In accordance with Resolution **657 (Rev. WRC-19)**, review the results of studies relating to the technical and operational characteristics, spectrum requirements and appropriate radio service designations for space weather sensors with a view to describing appropriate recognition and protection in the Radio Regulations without placing additional constraints on incumbent services.

WMO interests:

- Support of the space weather proposed definition and the approach regarding its recognition in the RR, through a subset of the MetAids service, called the MetAids (*space weather*)

WRC-23 decision :

- ➢ new Article 29 B: “Radio service related to space weather observations ”
- ➢ new WRC Resolution titled : “Importance of meteorological aids service (space weather) applications”
  - ✓ Recognition of radiocommunication service under which space weather sensor systems may operate : MetAids (space weather) allocations
  - ✓ SW definition,
  - ✓ Active space weather sensor definition
  - ✓ Receive-only space weather sensor definition

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Agenda item 9.1 - Topic d

Protection of EESS (passive) in the frequency band 36–37 GHz from non-GSO FSS space stations

WMO interests:

- Support of the protection of EESS (passive) sensors (including for the cold-sky calibration channel) in the band 36–37 GHz from non-GSO FSS operations in the band 37.5–38 GHz.
- Support of the implementation of an unwanted emission power density limit of −31 dBW/100 MHz in the frequency band 36-37 GHz as regulatory provisions in the RR to protect EESS (passive) sensors. This limit would be applicable to non GSO FSS constellations operating at altitudes above 407 km (minimum altitude of EESS (passive) sensors in this frequency band) and below 2 000 km (limited to LEO constellations).

WRC-23 decision :

- Footnote **RR 5.550CA** : Non-geostationary-satellite systems in the fixed-satellite service operating with an apogee altitude above 407 km and below 2 000 km in the frequency band 37.5-38 GHz shall not exceed an unwanted emission e.i.r.p. density of −21 dB(W/100 MHz) per space station for angles greater than 65.0° from nadir relative to the space station in the fixed satellite service in the frequency band 36-37 GHz in order to protect the Earth exploration-satellite service (passive) operating in the latter frequency band. (WRC-23)

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Thank you.

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