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Mid-Band Spectrum

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Mid-band spectrum issues before WRC23

AI 1.1- Protection of AMS/MMS from IMT in 4800-4990 MHz

AI 1.2- IMT in 6425-7025 MHz (R1) and 7025-7125 MHz (Global)

- 3300-3400 MHz R1FN
- 3300-3400 MHz R2
- 3600-3800 MHz R2
- 10-10.5 GHz R2

AI 1.1

to consider, based on the results of ITU-R studies, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the aeronautical and maritime mobile services located in international airspace and waters from other stations located within national territories, and to review the power flux-density criteria in No. **5.441B** in accordance with Resolution **223 (Rev.WRC-19)**

RES 223

potentially affected administrations when applying the procedure for seeking agreement under No. 9.21 by IMT stations in relation to aircraft stations, a coordination distance from an IMT station to the border of another country equal to 300 km (for land path)/450 km (for sea path) applies;

4 that in the frequency band 4 800-4 990 MHz, in order to identify potentially affected administrations when applying the procedure for seeking agreement under No. 9.21 by IMT stations in relation to fixed-service stations or other ground-based stations of the mobile service, a coordination distance from an IMT station to the border of another country equal to 70 km applies;

5 that the power flux-density (pfd) limits in No. **5.441B**, which is subject to review at WRC-23, shall not apply to the following countries: Armenia, Brazil, Cambodia, China, Russian Federation, Kazakhstan, Lao P.D.R., Uzbekistan, South Africa, Viet Nam and Zimbabwe,

invites the ITU Radiocommunication Sector

1 to conduct compatibility studies in order to provide technical measures to ensure coexistence between the MSS in the frequency band 1 518-1 525 MHz and IMT in the frequency band 1 492-1 518 MHz, including guidance on the implementation of frequency arrangements for IMT deployment in the frequency band 1 427-1 518 MHz, taking into account the results of these studies;

2 to study the technical and regulatory conditions for the protection of stations of the AMS and the maritime mobile service (MMS) located in international airspace or waters (i.e. outside national territories) and operated in the frequency band 4 800-4 990 MHz;

3 to continue providing guidance to ensure that IMT can meet the telecommunication needs of developing countries and rural areas;

4 to include the results of the studies mentioned in *invites the ITU Radiocommunication Sector* above in one or more ITU-R Recommendations and Reports, as appropriate,

invites the 2023 World Radiocommunication Conference

to consider, based on the results of the studies referred to in *invites the ITU Radiocommunication Sector* above, possible measures to address, in the frequency band 4 800-4 990 MHz, protection of stations of the AMS and MMS located in international airspace and waters from other stations located within national territories and to review the pfd criteria in No. **5.441B**.

Protection of AMS/MMS in 4 800-4 990 MHz

- ✓ The issue is more of regulatory and geo-political nature wherein a set of countries are in support of AMS/MMS whereas other set of countries are more inclined towards IMT.
- ✓ Sharing studies done by Russia, China, France, IAFI etc. Most of the countries Russia, China, India, NZ&ZWE (except a Group - US, France etc.) are in favour of IMT with relaxed or no pfd.
- ✓ Russia and China are against the protection of AMS/MMS in the international airspace whereas French and USA wants protection of AMS/MMS and supporting NOC or relaxed pfd values.
- ✓ African countries (Nig, Zimb, SA) want no restriction on IMT and suggested only No. 9.21. Russia, China, Vietnam, Brazil, SA, Zimb, Laos etc. are already having IMT without pfd.
- ✓ In India, we have mostly fixed point-to-point links in 140 MHz on lower side in border areas. The upper side 50 MHz is free and can be considered for IMT.

Protection of AMS/MMS in 4 800-4 990 MHz

Methods	Brief text of the method
A	NOC to RR
B	NOC to the RR except for modification of Resolution 223 to apply the existing pfd value to all countries listed in RR No. 5.441B
C	Modification of the existing pfd criteria in RR No. 5.441B
D	Modification of the existing pfd criteria in RR No. 5.441B and applying it to all countries listed in RR No. 5.441B
E	Keeping the existing pfd and extension of list of countries where it is not applied
F	Only application of RR No. 9.21 for the protection of AMS/MMS stations in international airspace and waters
G	Application of RR No. 9.21 and bilateral/multilateral coordination agreements with costal States for the protection of AMS/MMS stations in international airspace and international waters
H	Only application of RR No. 9.21 for the protection of AMS/MMS stations in international airspace and waters and protection of AMS/MMS is limited to national territory

Alt1/2: −134 dB(W/(m² · 1 MHz)) MMS (F/USA)
−138/140 dB(W/(m² · 1 MHz))AMS(F/USA)
Alt3 : −122 dB(W/(m² · MHz)) (China)
Alt4/5 : -115 MMS (IAFI/RUS)
-117 AMS (IAFI/RUS) RUS-EEZ

AI 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)**

RES 245

resolves to invite the ITU Radiocommunication Sector

1 to conduct and complete in time for WRC-23 the appropriate studies of technical, operational and regulatory issues pertaining to the possible use of the terrestrial component of IMT in the frequency bands listed in *resolves to invite the ITU Radiocommunication Sector* 2, taking into account:

– evolving needs to meet emerging demand for IMT;

– technical and operational characteristics of terrestrial IMT systems that would operate in these specific frequency bands, including the evolution of IMT through advances in technology and spectrally efficient techniques;

– the deployment scenarios envisaged for IMT systems and the related requirements of balanced coverage and capacity;

– the needs of developing countries;

– the time-frame in which spectrum would be needed;

2 to conduct and complete in time for WRC-23 the sharing and compatibility studies[1], with a view to ensuring the protection of services to which the frequency band is allocated on a primary basis, without imposing additional regulatory or technical constraints on those services, and also, as appropriate, on services in adjacent bands, for the frequency bands:

– 3 600-3 800 MHz and 3 300-3 400 MHz (Region 2);

– 3 300-3 400 MHz (amend footnote in Region 1);

– 7 025-7 125 MHz (globally);

– 6 425-7 025 MHz (Region 1);

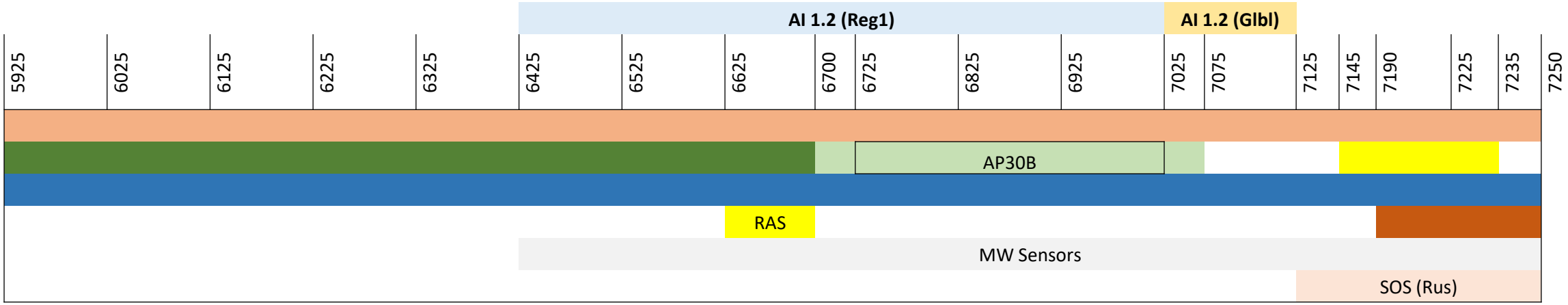
– 10.0-10.5 GHz (Region 2),

resolves

1 to invite the first session of the Conference Preparatory Meeting for WRC-23 to define the date by which technical and operational characteristics needed for sharing and compatibility studies are to be available to ensure that studies referred to in *resolves to invite the ITU Radiocommunication Sector* can be completed in time for consideration at WRC-23;

2 to invite WRC-23 to consider, based on the results of the above studies, additional spectrum allocations to the mobile service on a primary basis and to consider identification of frequency bands for the terrestrial component of IMT, the frequency bands to be considered being limited to part or all of the frequency bands listed in *resolves to invite the ITU Radiocommunication Sector* 2,

IMT in 6 425-7 125 MHz



EESS (UL)
SRS
Fixed
FSS (UL)
Mobile
FSS (UL/DL)

India- FSS UL in 5925-6425 and 6425-6725 MHz
Inmarsat and NavIC in 6425-6725 MHz
FSS Plan UL in 6725-7025 MHz
MW links, mostly in 5925-6425 MHz

6-7 GHz allocations

IMT in 6 425-7 125 MHz studies (FSS) and Reg1 countries?

- ✓ Most of the Reg1 countries are in favour of IMT identification at WRC23 except UK, Germany, Sweden, who are yet to decide. France, Finland, Latvia, Slovenia want IMT w.e.f. 2030 for 6G
- ✓ Denmark, Norway are supporting No Change status whereas Spain, Italy are in general supporting satellite protection.
- ✓ 20 studies for FSS UL scenario, out of which 16 having Global beam (11:5), 8 Hemi Beam (5:3), 5 Zone beam (5:0), 6 Spot Beam (3:3).
- ✓ Out of 16 global beam studies, Russia, China, France, Japan, UAE and others (total 11 studies) are showing IMT is feasible whereas studies from IAFI, GSOA, Inmarsat and some island countries (total 5 studies) showing IMT is not feasible.
- ✓ IAFI, GSOA, USA, Japan, Korea, Australia, Singapore, Brazil and some island countries are supporting RLAN/WiFi in this band.
- ✓ FSS DL studies showing need of separation distances of few tens of Kms to protect the operation of non-GSO FSS Earth stations.

IMT in 6 425-7 125 MHz **studies (FS) and Reg1 countries?**

- ✓ Four studies shows separation distance ranged from 10 to 68 km for FS antenna main lobe interference scenario and 1 to 10 km in the FS side lobe interference scenario. Two sensitivity analysis shows these figures ranging <1.5 to 58 km.
- ✓ MW Backhaul links of TSPs in the band 5 925 to 6 425 MHz.
- ✓ China and some other Reg3 countries are in support of IMT.
- ✓ Some FSS UL usages in India in lower 300 MHz of the band 6 425 - 7 025 MHz, this portion can be supported for IMT. We are already supporting IMT in 7 025 - 7 125 MHz.

IMT in 6425-7025 & 7025-7125 MHz

Methods	Brief text of the method
4A/5A	NOC to RR
4B/5B	IMT by creating a new RR footnote without any conditions
4C/5C	IMT by creating a new RR footnote with conditions which are contained in a draft new WRC Resolution
4D/5D	IMT by creating a new RR footnote with conditions which are contained in a draft new WRC Resolution and which are applied only within portion of the frequency band 6 425-7 025 MHz IMT by creating a new RR footnote with a requirement to implement technical measures to protect SOS (Earth-to-space) in the band 7 100-7 155 MHz
4E/5E	IMT by creating a new RR footnote, specifying the use is expected from 2030* onwards

Key mid-band issues before WRC23

Frequency bands	Incumbents/ Stakeholders	concerns	What next????
AI 1.1 (4 800-4 990 MHz band)	fixed services	• In 4 800-4 940 MHz Fixed p-to-p links mostly near borders. • 4 940-4 990 MHz is vacant as of now (except some legacy fixed links)	• IMT in full or portion of the band i.e. 4940-4 990 MHz • IMT with pfd, with 9.21 or without any such limitation or coord ? • If IMT with pfd then what should be pfd limits?
AI 1.2 (6 425-7 125 MHz band) 6 425-7 025 MHz Reg1 7 025-7 125 MHz Global	FSS (DOS), FS (TSPs, Captive users)	• DOS usages 6 425 to 7 125 MHz • Fixed p-to-p links of TSPs in 5 925 to 6 425 MHz • Captive Fixed p-to-p links in 6 425 to 7 725 MHz	• IMT(5G/6G) in 6 425 to 7 125 MHz Or part of the band; OR • RLAN/Wifi (6e) in 5 925 to 6 425 MHz or Whole 1200 MHz segment, • IMT and/or Wifi with Satellite and/or Fixed services? • Time line for IMT like French proposing? • If IMT for reg1 and/or reg3, what shall be protection limits for satellites UL, keep-off distance for Fixed and Satellite earth stations?

THANKS