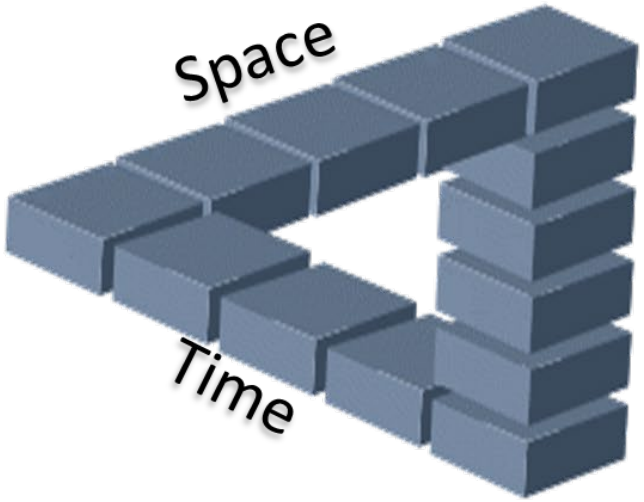
WRC and APG processes

Jitendra Singh
Head Govt. Affairs (Qualcomm India) &
Spectrum Strategy (Qualcomm APAC)

Agenda

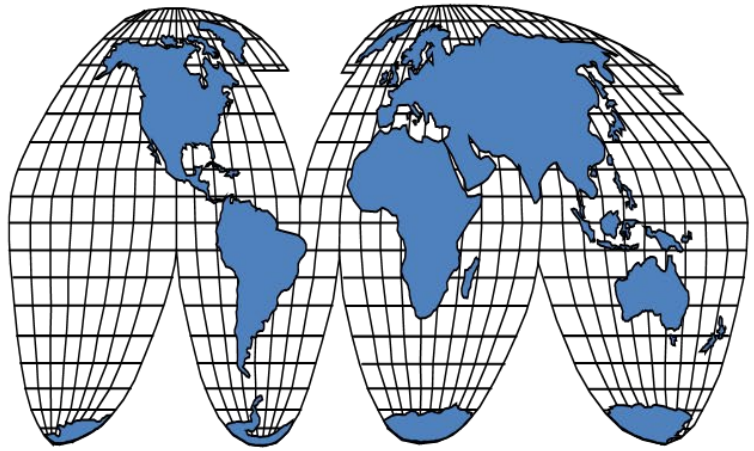
- Overview of WRC and APG process
- Importance of India APG work
- Important role of India in leading Agenda 1.7 of WRC-27

Spectrum : Characteristics



Frequency

Global Harmonization

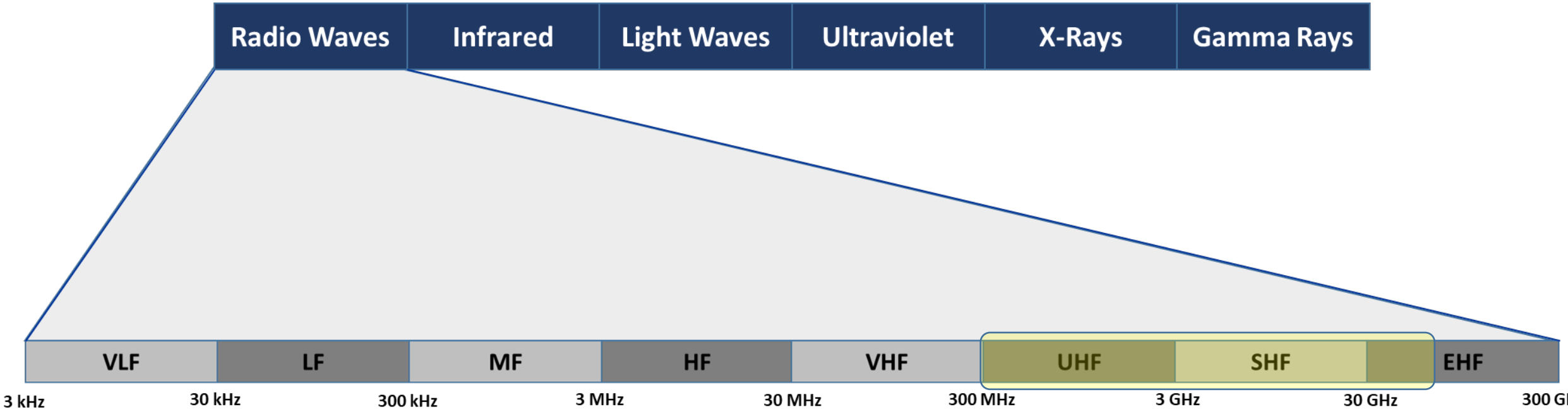


- Geo-Politics
- Technology
- Economics

Spectrum does not have boundaries hence harmonization and coordination is must

Electromagnetic Spectrum

Radio Waves are used for carrying various services

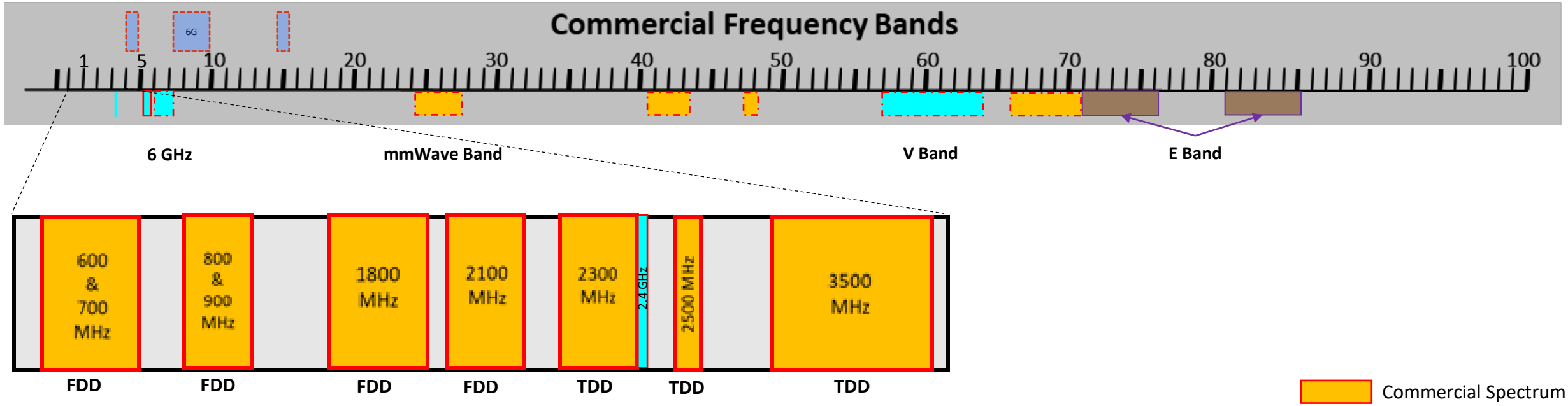


Fraction of the EM Spectrum is Useful for Communication

Harmonized Bands

Key Commercial Frequency Bands

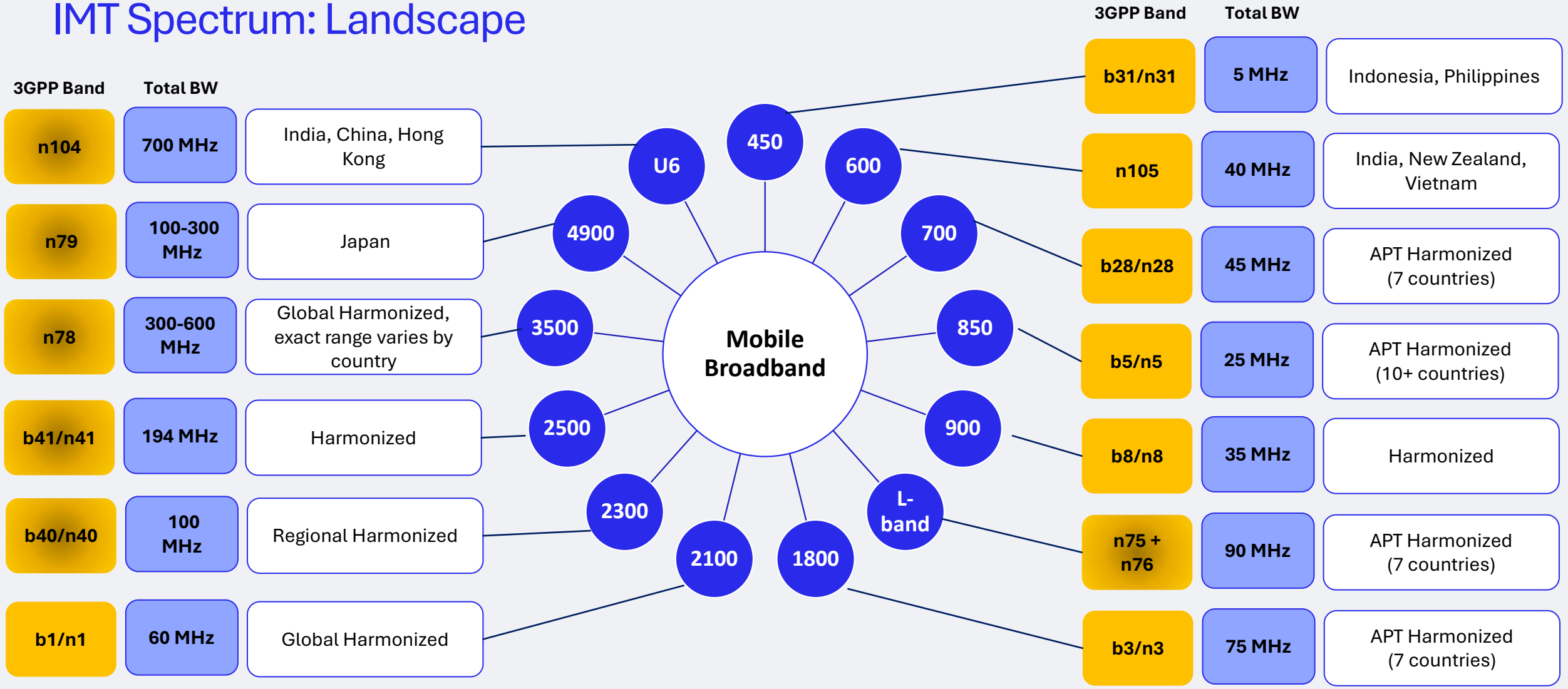
Lower Spectrum Bands (< 2 GHz) Are Typically FDD
Higher Spectrum Bands (> 2 GHz) Are Typically TDD



FDD – Frequency Division Duplex – Lower Spectrum Bands < 1 GHz
TDD – Time Division Duplex – Higher Spectrum Bands > 1 GHz

- Commercial Spectrum
- Auctioned in 2022
- Unlicensed Spectrum
- Delicensing Discussion
- WRC27 AI 1.7 Studies Priority

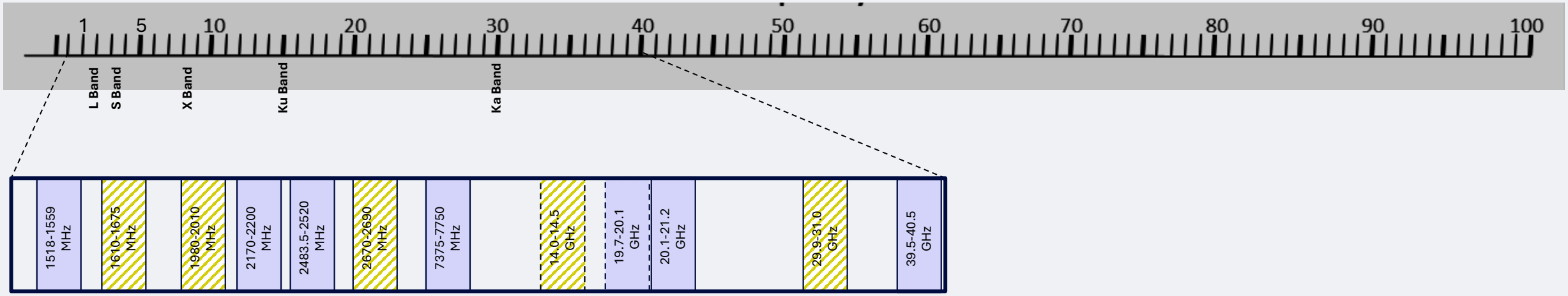
IMT Spectrum: Landscape



Spectrum Bands need to be Regionally Harmonized

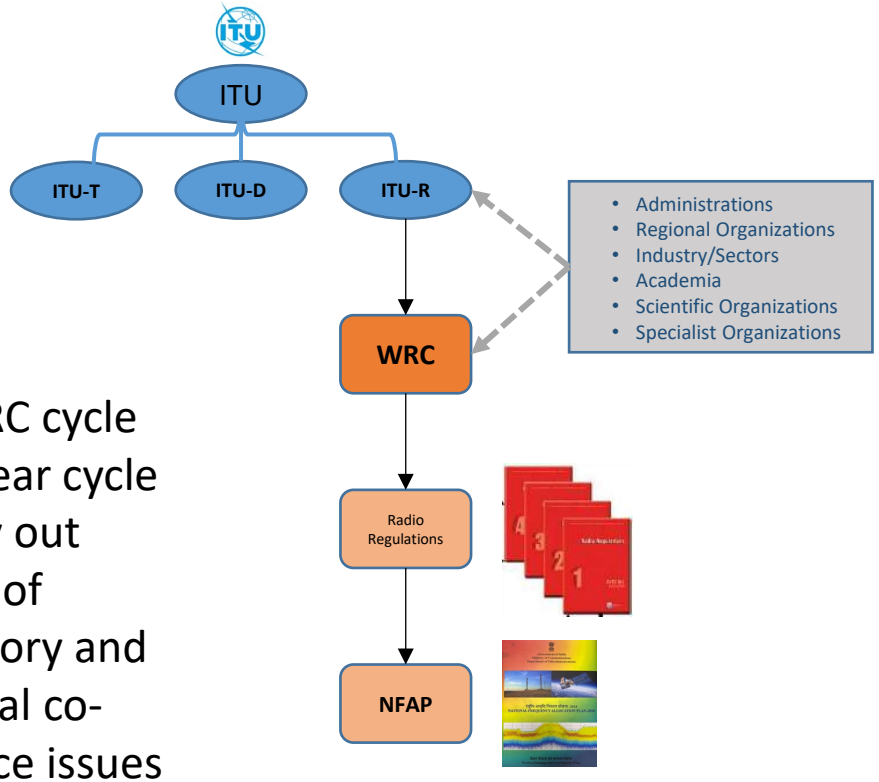
Spectrum : Harmonization

Key MSS Frequency Bands

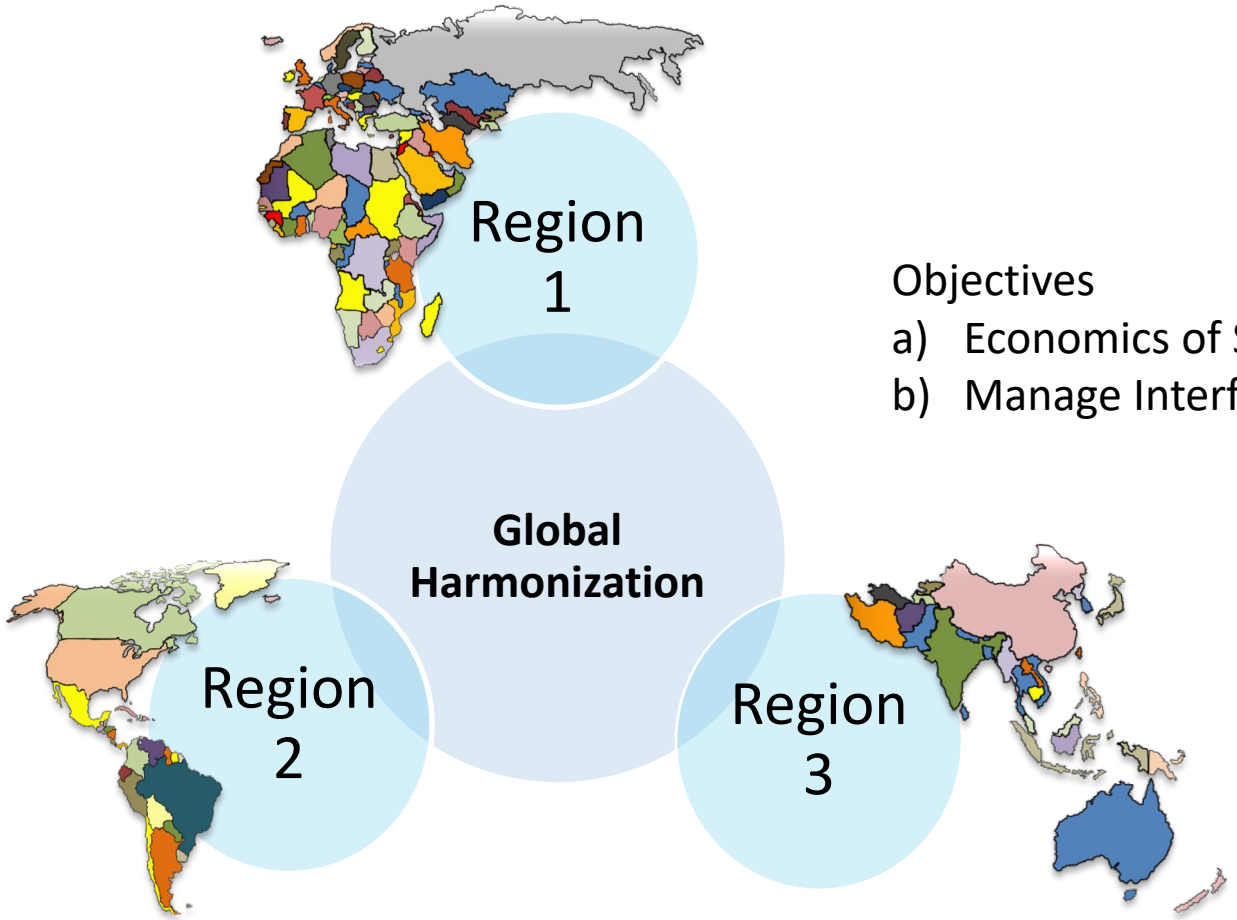


Harmonization Process

ITU Process : Global Harmonization



The WRC cycle is a 4-year cycle to carry out studies of Regulatory and Technical co-existence issues

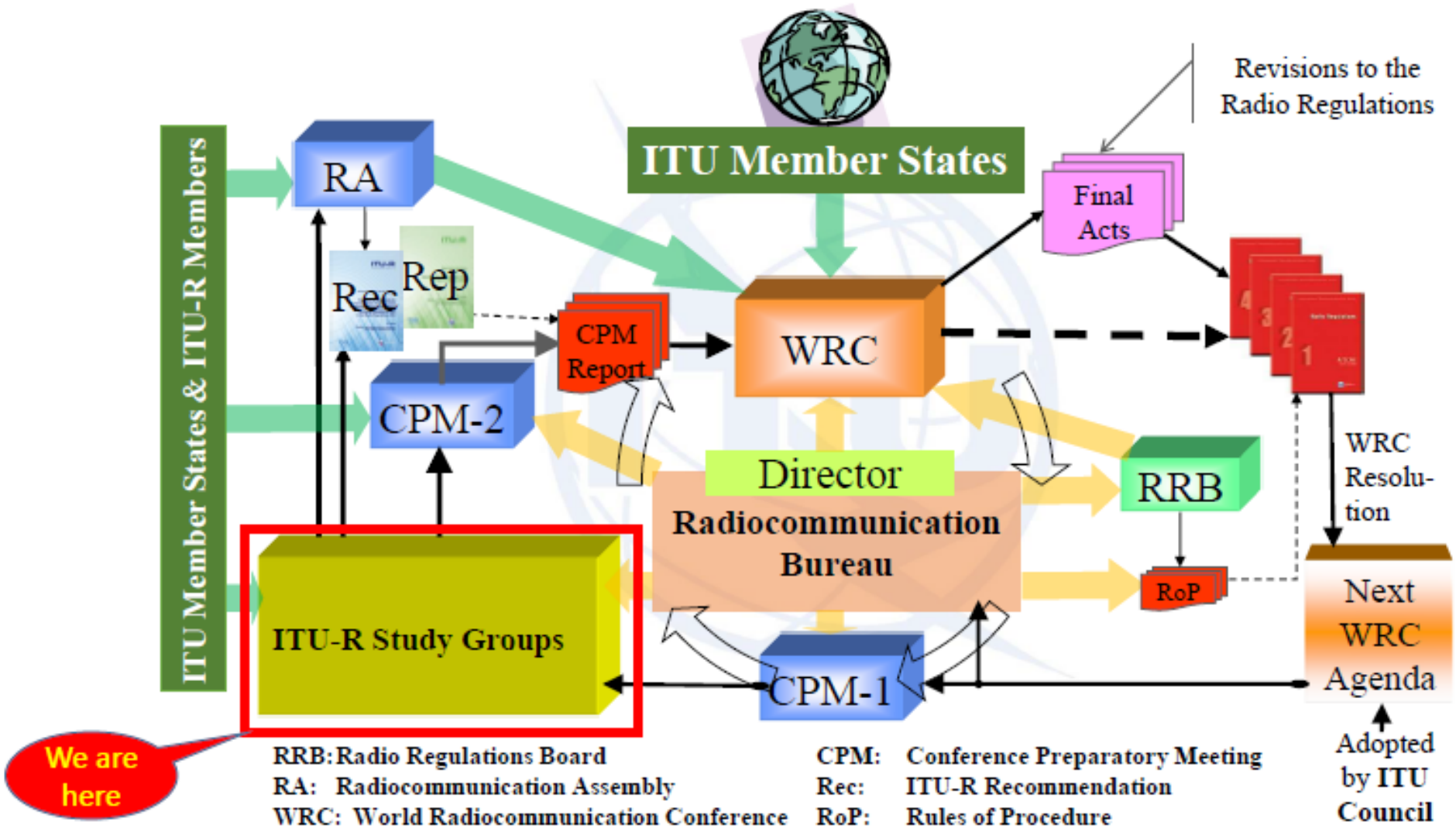


Objectives

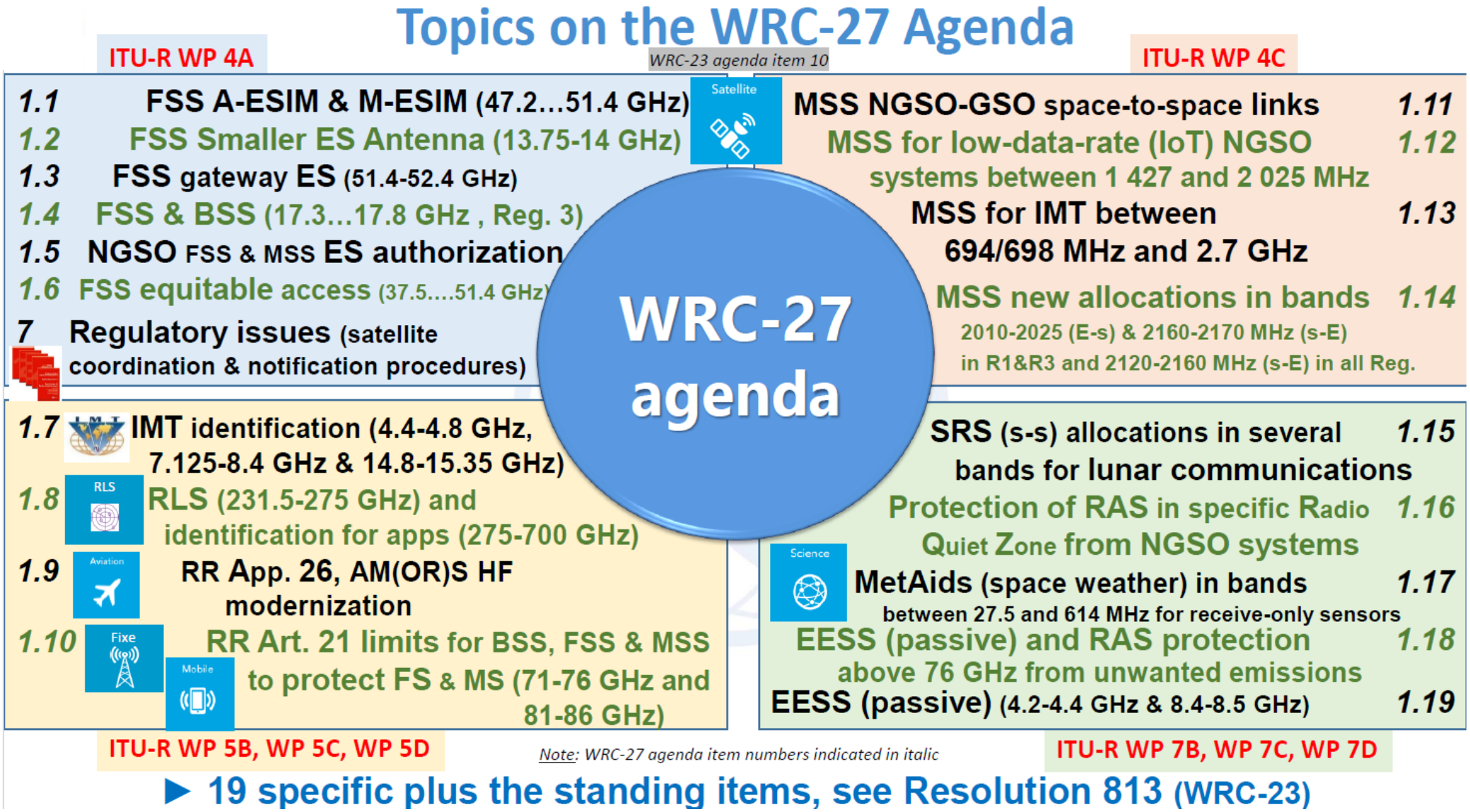
a) Economics of Scale
b) Manage Interference

Spectrum is Globally and Regionally Harmonized

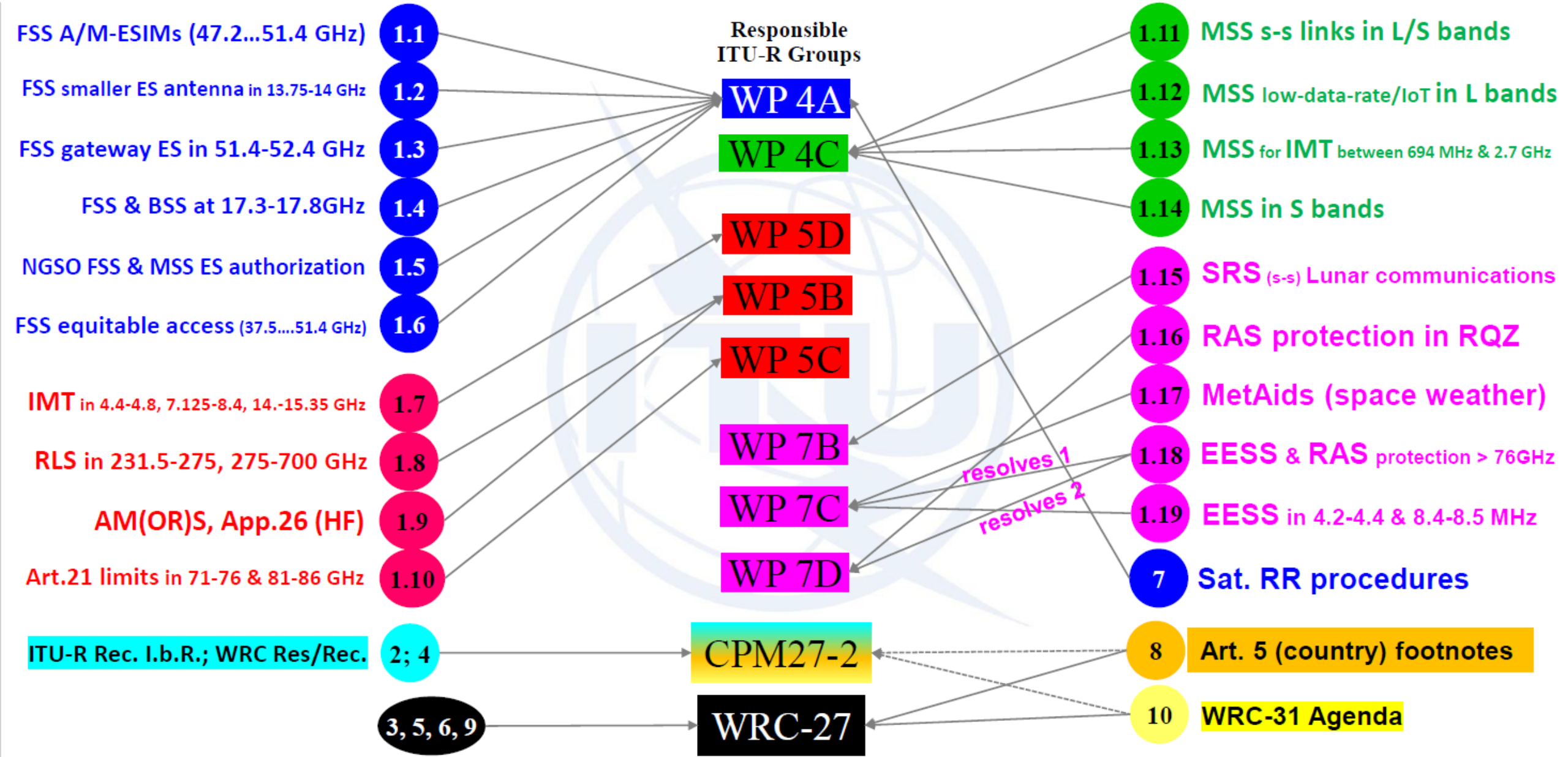
Main Steps towards WRC-27



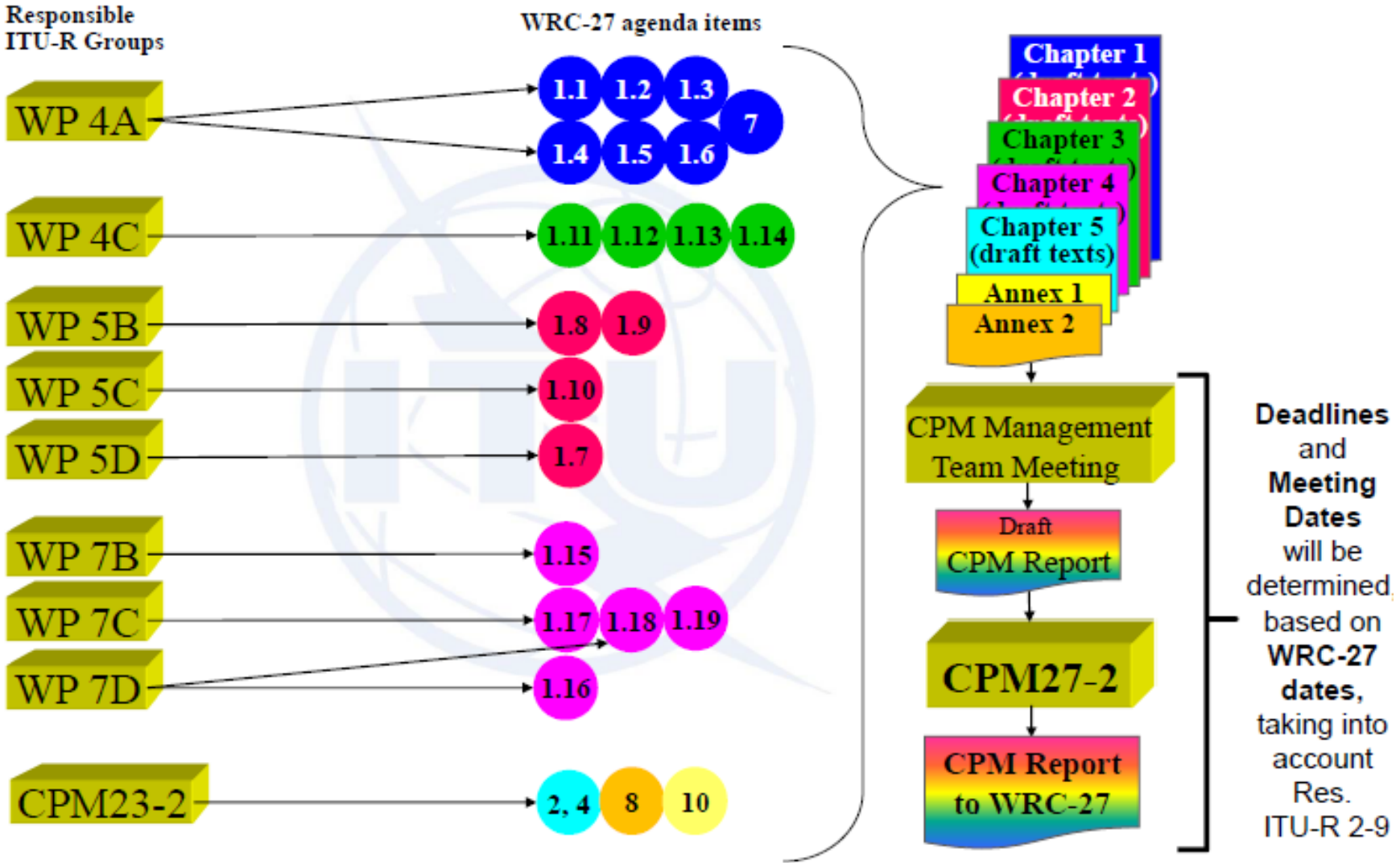
Work Allocation of WRC-27 Agenda Items



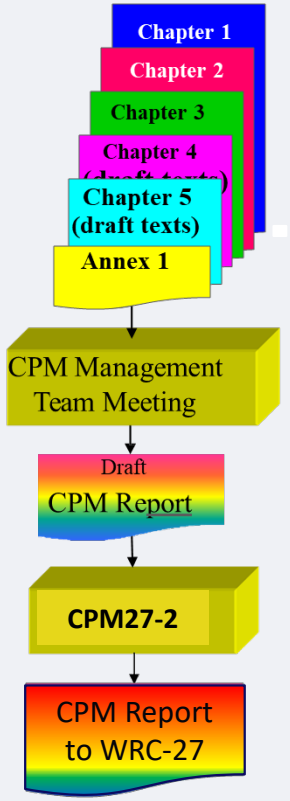
WRC-27 agenda items & Responsible Groups



Summary of CPM Report Preparation



Main Steps towards WRC-27



WRC-23

Resolution 811 (WRC-23)

Dec 2023

Agenda WRC-27

CPM27-1

18-19 Dec. 2023

Meetings of ITU-R

SGs, WPs/TG responsible/ contributing on AIs

CPM27-2

Final CPM Report to be available ~5 months prior to WRC-27

National/Regional Preparations

- **APG27-01 : 03 - 06 June 24**
- **APG27-02 : 28 Jul-01 Aug 25**
- **APG27-03 : 27 - 31 July 26**
- **APG27-04 : TBD**
- **APG27-05 : TBD**

Final Regional Group meetings
National Preparations
Member States' (Common) Proposals to WRC-27

WRC-27

Shanghai, China; Dates : TBD

- Committee 1: Steering Committee
- Committee 2: Credentials Committee
- Committee 3: Budget Control Committee
- Committee 4 : Specified Agenda Items (terrestrial issues)
- Committee 5 : Specified Agenda Items (satellite issues)
- Committee 6 : Specified Agenda Items (general issues)
- Committee 7: Editorial Committee

APG27-3 : Objectives

- to review the results of the APG27-2 meeting
- to consider the progress in ITU-R Study Groups in relation to WRC-27 Agenda items, and take necessary actions, as appropriate
- to update the APT preliminary views on WRC-23 Agenda Items based on input contributions from APT Members
- to contribute, where necessary, to the activities of APT Preparatory Group for PP-26 with respect to the issues relevant to the purview of the APG
- to discuss APT preparations for the ITU Inter-regional Information Seminar on WRC-27 agenda items
- to review the activities of other regional organisations, in particular, their preliminary views/positions with a view to fostering inter-regional cooperation
- to start the development of a draft agenda for WRC-31, and a preliminary agenda for WRC-35, taking into account the preliminary agenda for WRC-31 is available in Resolution 814 (WRC-23)
- to review of issues related to RA-27 and develop preliminary views of APT, if any

APG27-3 : Expected Outcomes

- Preliminary views on WRC-27 Agenda Items
- Preliminary views on issues related to RA-27, if any
- Objectives and expected outcomes of APG27-4
- Contribution, if possible and where necessary, to the APT Preparatory Group for PP-26
- Preliminary text towards draft agenda of WRC-31
- Revisions to the APG work plan for the preparation of WRC-27, if any

APG27 : Structure

- Chairman : Mr. Nobuyuki Kawai (J)
- Vice Chair : Mr. Christopher Worley (AUS)
- Vice Chair : Ali Reza Darvishi (IRN)
- Special Advisor : Mr. Zhao Zheng (CHN)
- Chair - Editorial Committee : Mr. Bharat Bhatia (IND)

Chairs and Co-chairs of the Working Parties of APG-27

WP1: Fixed-satellite and broadcasting-satellite issues

- Co-Chairs:
  - Ms. Cheng Fenhong (CHN) (AIs: 1.5, 1.6, 7)
  - Mr. Mrunmaya Kumar Pattanaik (IND) (AIs: 1.1, 1.2, 1.3. 1.4)

WP2: Fixed, mobile and radiolocation issues

- Co-Chairs:
  - Mr. Satoshi Imata (J) (AIs: 1.8, 1.9)
  - Mr. Bui Ha Long (VTN) (AIs: 1.7, 1.10)

WP3: Mobile-satellite issues

- Co-Chairs:
  - Dr. Meiditomo Sutyarjoko (INS) (AIs: 1.12, 1.14)
  - Dr. Dae-sub Oh (KOR) (AIs: 1.11, 1.13)

WP4: Science issues

- Chair: Dr. Wahyudi Hasbi (INS)

WP5: General Issues

- Chair: Dr. Jae-woo Lim (KOR)

Note : DG Chairs for Agenda item 10 to be nominated during APG27-3

AI10 : Proposed New Spectrum for IMT (WRC-23)

Country	Frequency Band(s) Proposed
Japan	12.75 - 12.95 GHz
China	6 425 - 7 025 MHz (R3)
Mexico	4 800 - 4 900 MHz, 6 425 - 7 025 MHz (R2) 7 025 - 7 125 MHz, 10.5 - 10.68 GHz
USA	3 100 - 3 300 MHz, 12.7 - 13.25 GHz
India	7 125 - 7 750 MHz, 9 800 - 10 000 MHz 10.5 - 10.68 (10.7) GHz, 14.5 - 15.35 GHz
LAO/Vietnam	Portions of 7 125 - 8 500 MHz Portions of 8 500 - 10 000 MHz 12.75 - 13.25 GHz, 13.25 - 14.3 GHz 14.5 - 15.35 GHz
MYA/PNG/SLM/SAM/TON/VAN	Do not support a new AI. Strongly oppose 10.7 - 14.8 GHz
CEPT	strongly opposed 7-30 GHz
China	strongly opposed 7-30 GHz
ATU	Neutral position
RCC	4.4-4.8 GHz, 10-10.5 GHz, 14.8-15.35 GHz
ASMG	3.8-4.2 GHz, 7-15 GHz
CITEL	3100-3300 MHz, 7125-8500 MHz 14.75-15.35 GHz

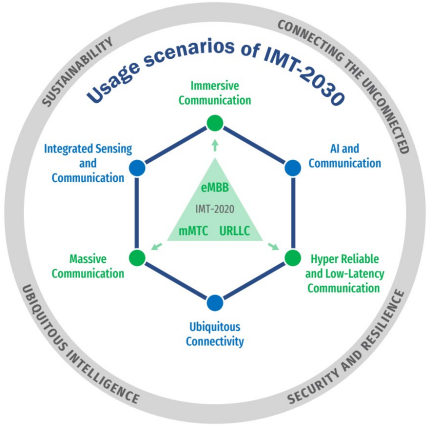
Spectrum Bands Identified for IMT studies

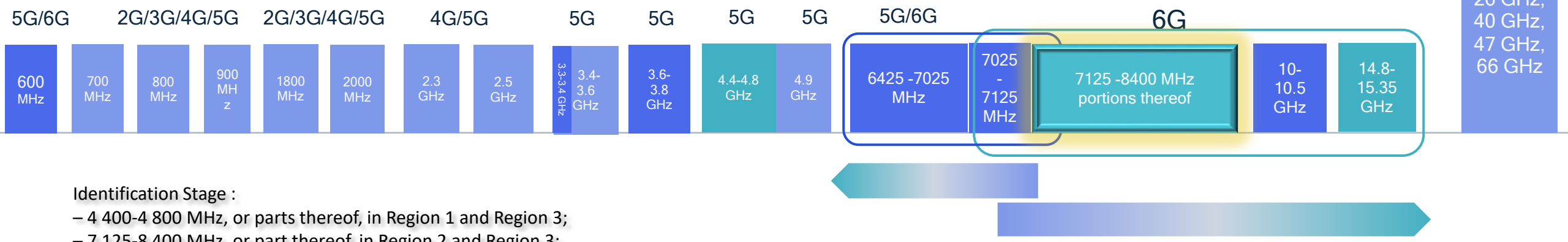
WRC-27 Agenda item 1.7

Administrations or Regions will study new candidate bands for use by 6G/IMT-2030, for decisions WRC-27.

Study Stage :
- 4 400-4 800 MHz
- 7 125-8 400 MHz
- 14.8-15.35 GHz.

Additional contiguous broadband spectrum in FR3 range is required to support the immersive communication and high-resolution sensing in wide area coverage deployment.

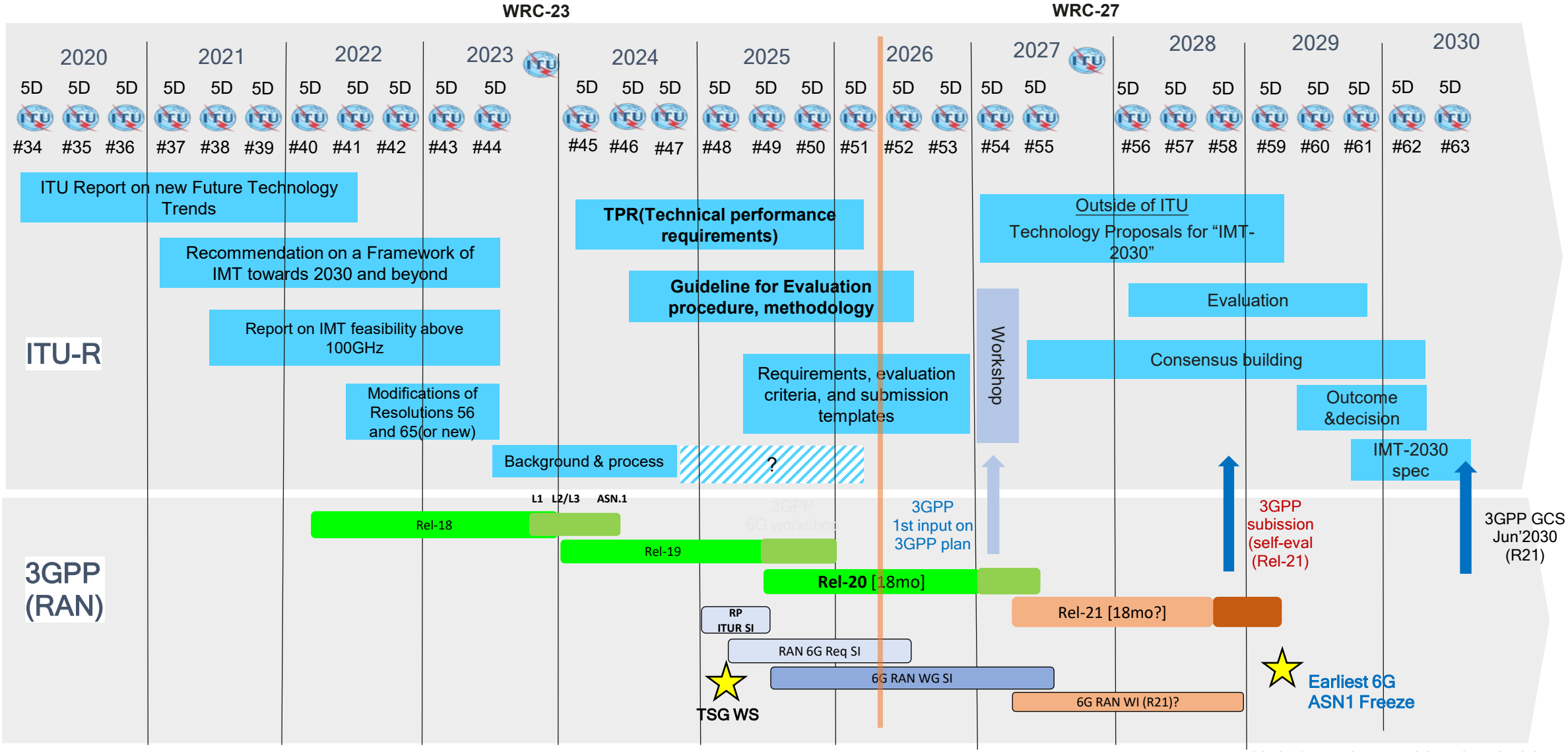




Identification Stage :
– 4 400-4 800 MHz, or parts thereof, in Region 1 and Region 3;
– 7 125-8 400 MHz, or part thereof, in Region 2 and Region 3;
– 7 125-7 250 MHz and 7 750-8 400, or part thereof, in Region 1;
– 14.8-15.35 GHz, Global

Existing IMT
IMT spectrum identified at WRC-23
IMT spectrum to be studied towards WRC-27

WP5D : IMT-2030 & 3GPP Timelines



*Provided 3GPP and ITU-R stick to the schedules

General grouping of interference scenarios

Satellite Downlink

FSS | MetSat | SRS (adj band)

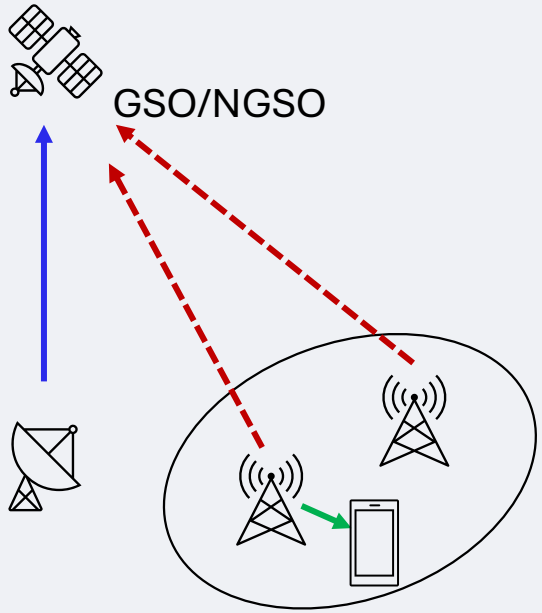
MSS | EESS

* Some of the Earth Stations could be both FSS / MSS

Satellite Uplink

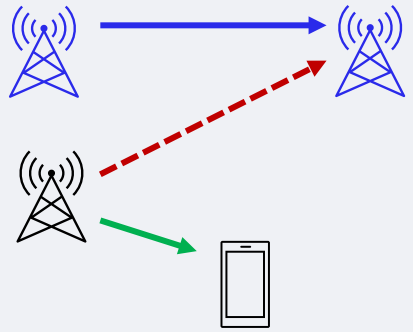
FSS | MetSat | SOS

MSS | SRS deep space | SRS near Earth



Terrestrial

FS

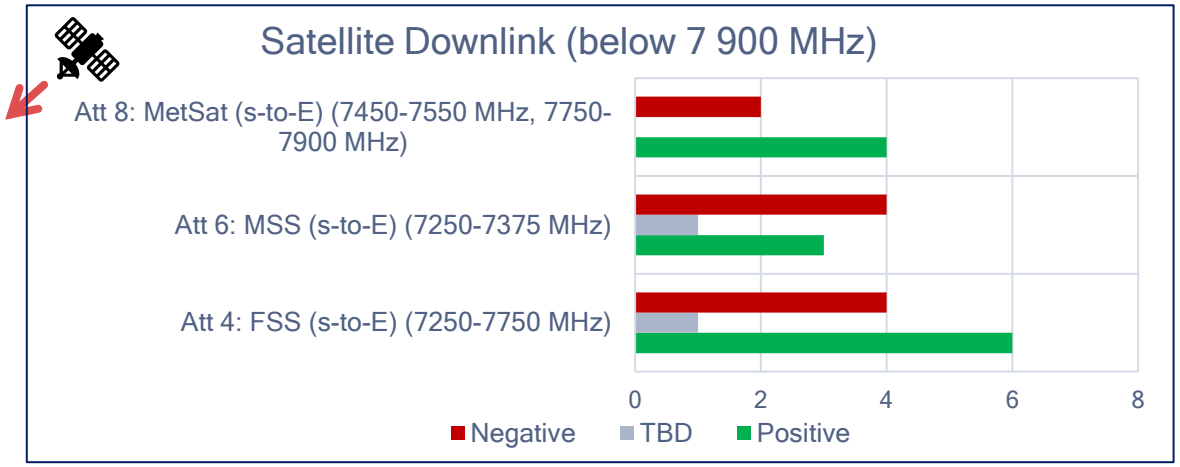


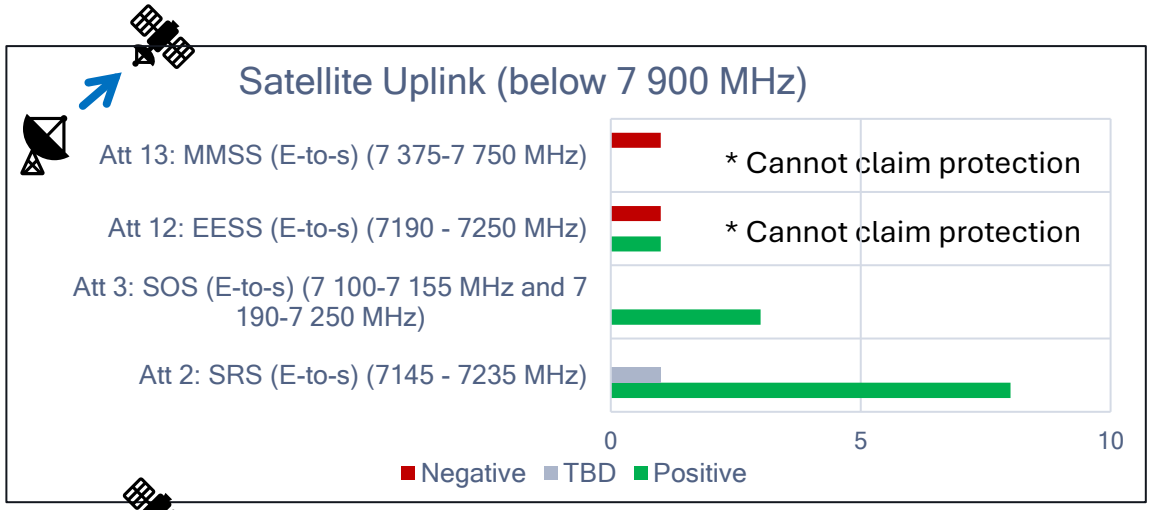
Incumbent link

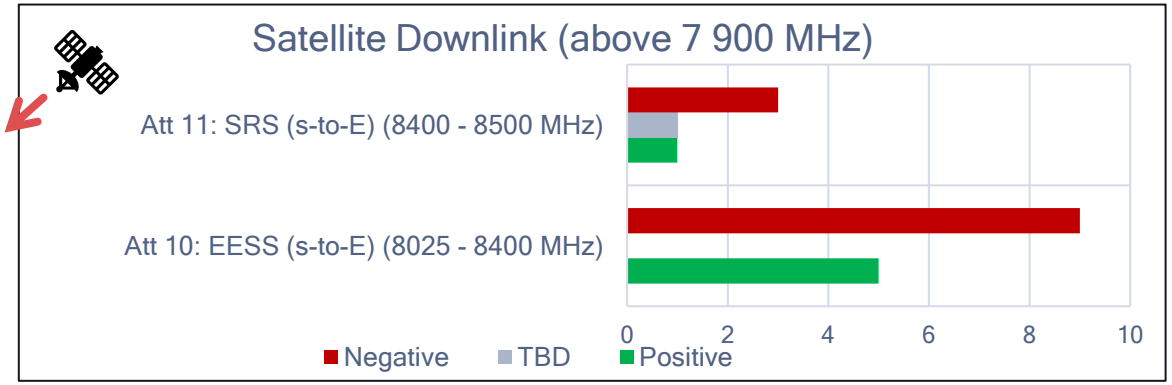
IMT link

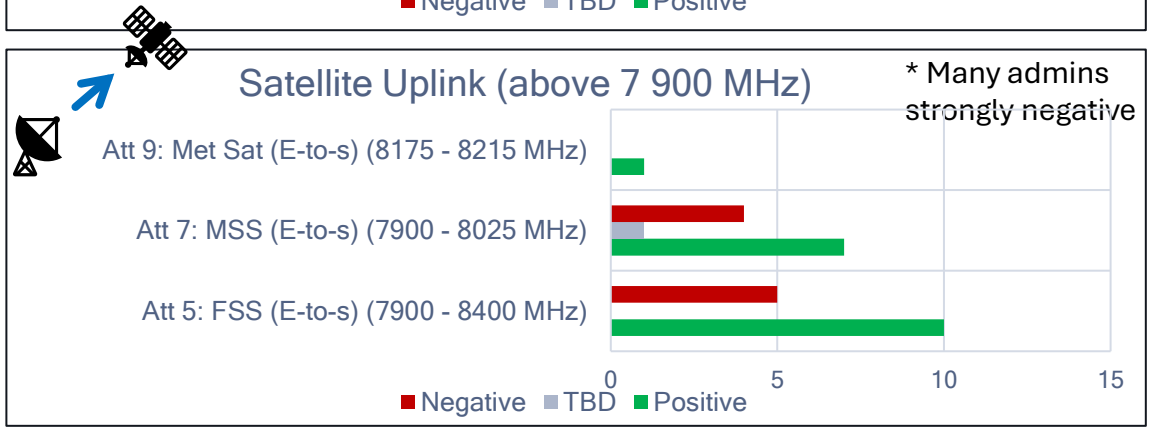
Interfering link

Brief Summary of 7-8 GHz studies









FSS/MSS/MetSat Downlink:

- Debate on applicability of Clutter Loss
  - key difference in +ve and –ve
- Debate on M.2101 v/s TVG
  - Key difference in conservative envelope v/s monte-carlo

FSS/MSS Uplink:

- Debate on Contour
  - 3dB / 20 dB / 30 dB / full-view
- Debate on high-gain satellite antenna (4A System K)
- Debate on apportionment and polarization losses

Preparation of CPM Text

- 5 input (China, Japan, Brazil, IAFI, and IRAN) merged
- Some admins would support NOC
- No real methods ➔ France raised that no need to consider EIRP mask again in upper part of the 7/8 GHz claiming the current standardization difficulties for U6 GHz mask
- 7.125 – 8.4 GHz band split into 3 ranges in accordance with Res 256 (WRC-23)
  - 7.125 - 7.250 GHz (Globally)
  - 7.250 - 7.750 GHz (Region 2 and 3)
  - 7.750 - 8.4 GHz (Globally)
- Some sections were discussed during the meeting
- Need to accelerate on CPM regulatory measures from June to October 2026

WRC-27 agenda Item - (Chapter) 2 Res.256 (WRC-23) (ex.COM6/26)
Doc. 5D/1191 (d) (a), Chapter 1 (a), Chapter 2 (a), Annex 2.9.8 (b), Chapter4 (a),
Annexes 4.1, 4.2 (c), 4.3, 4.4 (4.5, 4.6, 4.7, 4.8, 4.9, 4.10), 4.11 (4.12, 4.13, 4.14, 4.15, 4.16r1, 4.17, 4.18, 4.19, 4.20, 4.21, 4.22, 4.23, 4.24, 4.25), 4.26 (4.27, 4.28, 4.29, 4.30), 4.31,
Chapter 6 (a), Chapter 7 (a)

CPM27-2 : CPM Text and CPM Measures

- Example from WRC-23 (CPM23-2 report) :

Agenda item 1.2 : 6 425-7 125 MHz

- Primary Allocation – FS, FSS and MS
- Technical Studies :
  - FS – One study
    - Four studies using Monte-Carlo approach
    - One study using deterministic approach
  - FSS uplink (6 425-7 075 MHz) – 20 studies
    - 14 Studies : Yes for IMT and 6 Studies : No for IMT
    - Global Beam : 16 studies
    - Hemi Beam : 8 studies
    - Zone Beam : 5 studies
    - Spot beams : 6 studies
    - Appendix 30 B : 10 studies
  - FSS downlink (6 700-7 075 MHz) : Separation distance required
  - SOS (7 100-7 155 MHz) : Three studies
  - SRS (7 145-7 190 MHz) : Three studies for adjacent band

- Methods :
  - Method 4A: No change.
  - Method 4B: Identification of the frequency band 6 425-7 025 MHz in Region 1 for IMT without any conditions.
  - Method 4C: Identification of the frequency band 6 425-7 025 MHz in Region 1 for IMT with conditions contained in a draft new WRC Resolution.
  - Method 4D: Identification of the frequency band 6 425-7 025 MHz in Region 1 for IMT with conditions contained in a draft new WRC Resolution, applied only within a portion of the band.
  - Method 4E: Identification of the frequency band 6 425-7 025 MHz in Region 1 for IMT with conditions contained in a draft new WRC Resolution, with use expected as of 2030.

resolves of **Res 220** (WRC-23)

resolves

1 that administrations wishing to implement IMT in accordance with Nos. **5.457D**, **5.457E**, and **5.457F** consider use of the frequency bands referred to in those footnotes, taking into account the most recent versions of the relevant ITU-R Recommendations;

2 that, in order to ensure protection for the FSS (Earth-to-space), and taking into account *considering d)*, the level of expected e.i.r.p. spectral density emitted by an IMT base station as a function of the vertical angle above the horizon shall not exceed the following values (No. **21.5** does not apply):

Vertical angle range $\theta_L \le \theta < \theta_H$ (vertical angle θ above horizon)	Expected e.i.r.p. (dBm/MHz) (See NOTES 1, 2 and 3)
$0° \le \theta < 5°$	27
$5° \le \theta < 10°$	23
$10° \le \theta < 15°$	19
$15° \le \theta < 20°$	18
$20° \le \theta < 30°$	16
$30° \le \theta < 60°$	15
$60° \le \theta \le 90°$	15

NOTE 1: The expected e.i.r.p. is defined as the average value of the e.i.r.p., 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 $\theta_L \le \theta < \theta_H$.

NOTE 2: An IMT base station shall comply with the specified limits on expected e.i.r.p. spectral density for all mechanical tilts with which it can be deployed, taking into account *considering m)*.

NOTE 3: See the Annex to this Resolution for additional details on how the expected e.i.r.p. can be calculated for this frequency band.

3 that 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,

Thanks