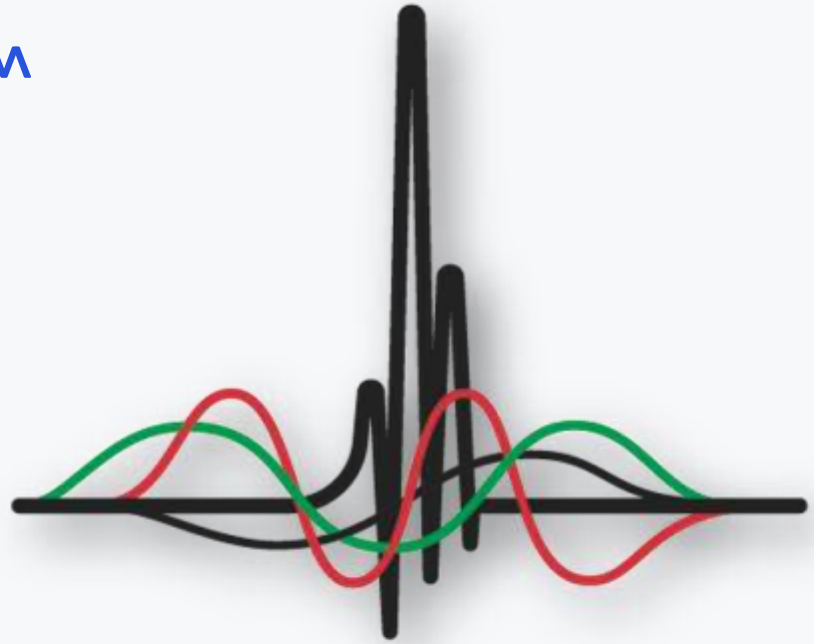
Qualcomm

IAFI Workshop

22 Feb 2024



ITU WRC DUBAI 2023

WRC-23 Terrestrial Outcomes

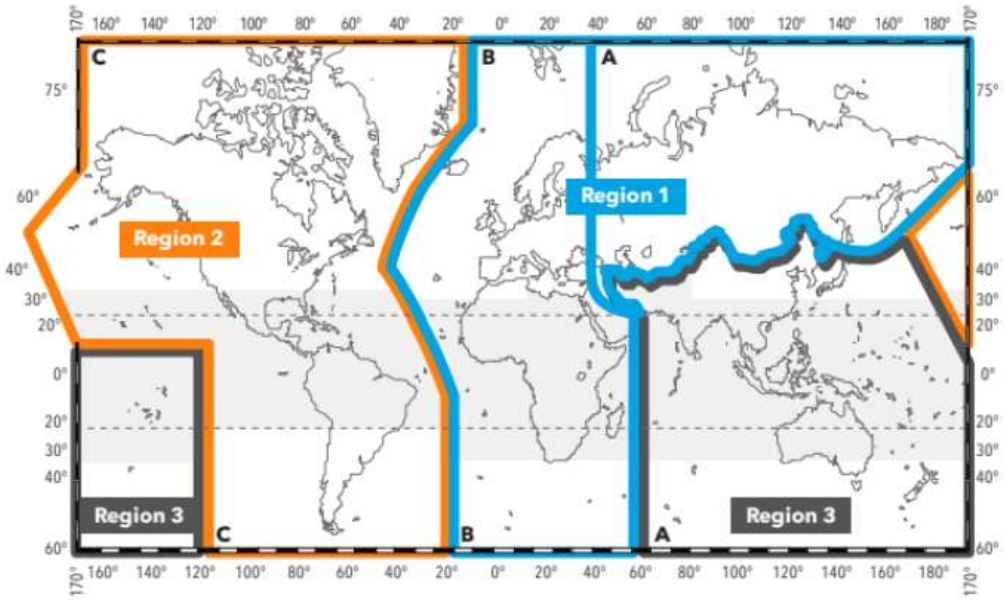
Punit Rathod

World Radiocommunication Conferences (WRC)

- Held every three to four years
- WRCs perform a complete and detailed review of the Radio Regulations (RR), the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits, and its Rules of Procedure (RoP)
- WRCs can also:
  - revise any associated Frequency assignment and allotment Plans
  - address any radiocommunication matter of worldwide character
  - instruct the Radio Regulations Board and the Radiocommunication Bureau, and review their activities
  - determine Questions for study by the Radiocommunication Assembly and its Study Groups in preparation for future Radiocommunication Conferences.

- **Bring together all stakeholders** in a process that is aimed at **building consensus**
- Provide a **stable** and **predictable regulatory environment** needed **for future investments**
- Enable **new radiocommunication systems** and **applications** to **access the radio spectrum**
- Protect the operation of **existing radiocommunication services**

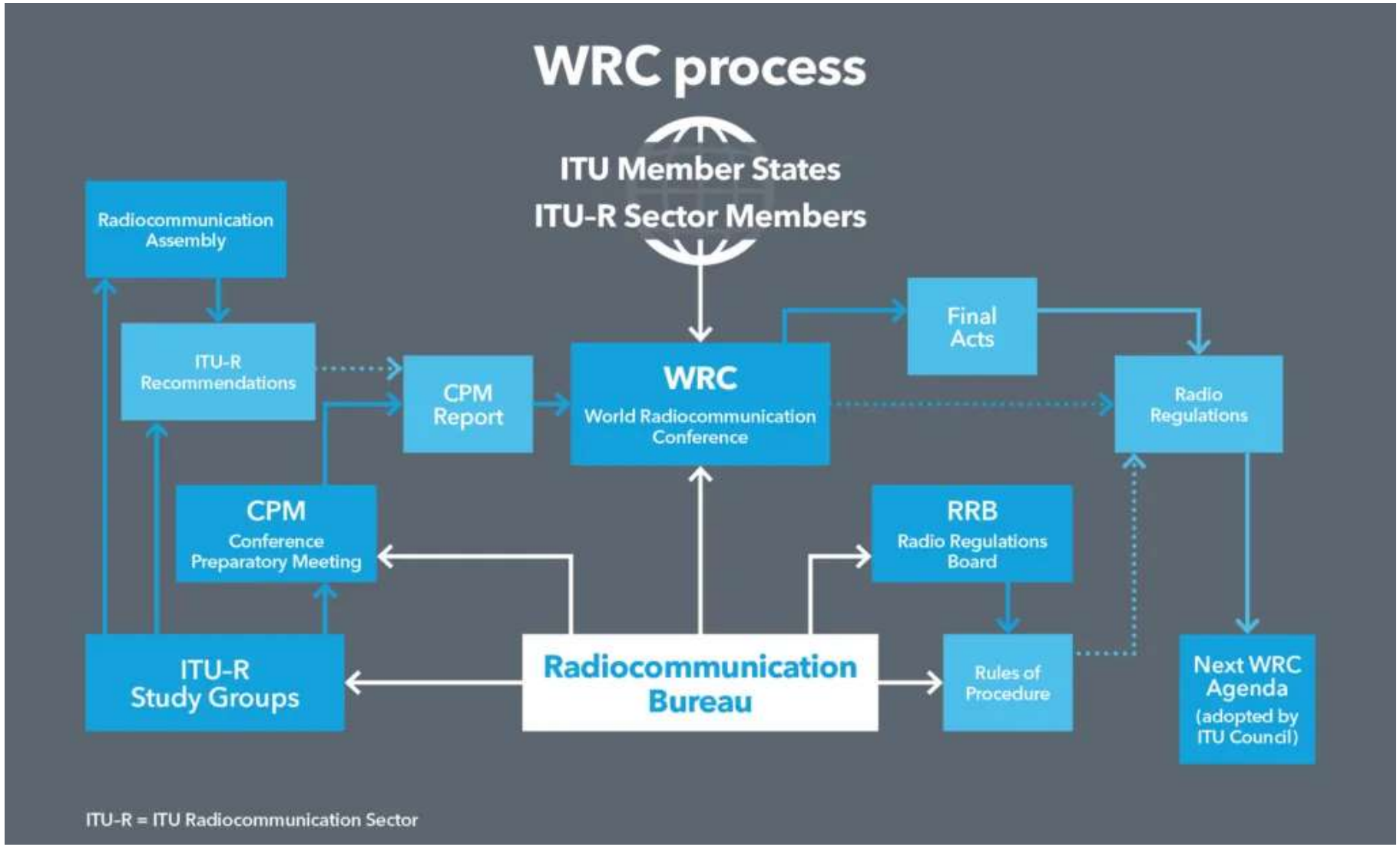
Worldwide or Regional Spectrum Harmonization



BENEFITS

- Reduces the potential for **harmful interference**
- Enables interoperability and **international roaming**, allowing citizens to use the same device in different countries
- Increases economies of scale, thereby enabling **affordable devices and services**
- Supports **emergency communications**

WRC Process


WRC process
ITU Member States
ITU-R Sector Members
Radiocommunication Assembly
ITU-R Recommendations
CPM Report
WRC
World Radiocommunication Conference
Final Acts
Radio Regulations
CPM
Conference Preparatory Meeting
RRB
Radio Regulations Board
ITU-R Study Groups
Radiocommunication Bureau
Rules of Procedure
Next WRC Agenda
(adopted by ITU Council)
ITU-R = ITU Radiocommunication Sector

WRC Cycle

WRC-19

Modified the RR (2016), Defined the agenda for WRC-23

CPM23-1

Allocated the work of the agenda items to relevant working parties of ITU-R Study Groups, defines chapter rapporteur and the structure of the CPM Report

ITU-R Study Groups

Conducts studies for 4 years and prepares draft CPM text

ITU-R Study Groups:

- SG-1: **Spectrum** management
- SG-3: Radiowave **propagation**
- SG-4: **Satellite** services
- SG-5: **Terrestrial** services
- SG-6: **Broadcasting** service
- SG-7: **Science** services

CPM23-2

Concolidates the results of studies in CPM text that includes the methods to solve each agenda item

RA-23

Appoints the chairmen and vice charmen of the Study Groups, revises the structure of the Study Groups, approves ITU-R recommendations, revises ITU-R resolutions

WRC-23

Modifies the RR (2020) (e.g. allocates frequencies), Defines the agenda for WRC-27

ITUWRC SHARM EL-SHEIKH2019
28 October - 22 November
Sharm El-Sheikh, Egypt

Regional Groups / Multi-countries

ITUWRC UAE2023

Consolidates Regional and multi-country proposals

CEPT APT ASMG RCC CITEL ATU

Principal themes at WRC-23

MOBILE

1.1
1.2
1.3
1.5

1.4
1.6
1.7
1.8
1.9
1.10
1.11

TRANSPORT

SATELLITE

1.15
1.16
1.17
1.18
1.19

1.12
1.13
1.14

SCIENCE

Principal themes at WRC-23

MOBILE

1.1
1.2
1.3
1.5

Theme of this presentation

1.4
1.6
1.7
1.8
1.9
1.10
1.11

TRANSPORT

SATELLITE

1.15
1.16
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1.12
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1.14

SCIENCE


ITUWRC
DUBAI2023

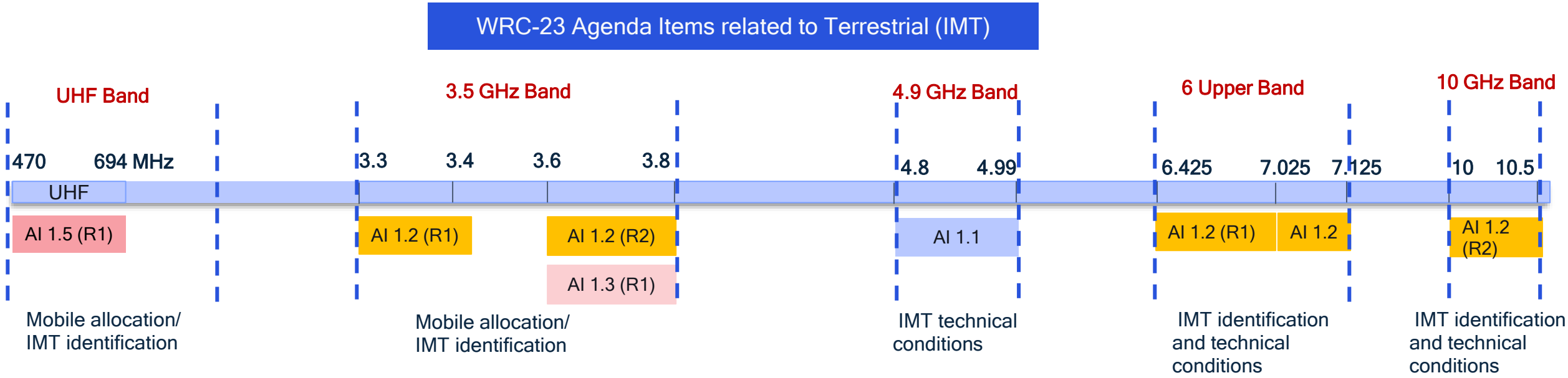
ITU-R Preparatory Studies for WRC-23

Resolution 811 (WRC-19) contains the WRC-23 agenda.

WRC-23 agenda Item (Chapter)	Topic	WRC Resolution (*)	Responsible Group(s)	Information from Responsible Group(s) TIES
1		-	-	-
1.1 (1)		Res.223 (Rev.WRC-19)	WP 5B (1) WP 5D (1)	**Report of the CPM to WRC-23 (Chapter 1 and Annex 2)**; Doc. 5B/731 Sec. 2.1, 7, 10.2 & 10.2.1.1 and Annex 7; Doc. 5D/1555 (a) and Chapter 4 Annexes 4.7.1, 4.7.2 & 4.8 and other relevant Chapters and Annexes
1.2 (1)		Res.245 (WRC-19)	WP 5D	**Report of the CPM to WRC-23 (Chapter 1 and Annex 2)**; Doc. 5D/1555 (a) and Chapter 4 Annexes 4.10.1 & 4.10.2, and other relevant Chapters and Annexes
1.3 (1)		Res.246 (WRC-19)	WP 5A	**Report of the CPM to WRC-23 (Chapter 1 and Annex 2)**; Doc. 5A/708 Sec. 2, 3.6, 4 & 5 and Annexes 3 (a), 5 & 22
1.4 (1)		Res.247 (WRC-19)	WP 5D	**Report of the CPM to WRC-23 (Chapter 1 and Annex 2)**; Doc. 5D/1555 (a) and Chpater 4 Annexes 4.28.1 & 4.28.2, and other relevant Chapters and Annexes
1.5 (1)		Res.235 (WRC-15)	TG 6/1 (2)	**Report of the CPM to WRC-23 (Chapter 1 and Annex 2)**; **Supporting materials**: Doc. 6-1/130 and Annexes 2 and 3

WRC-23 Key Decisions

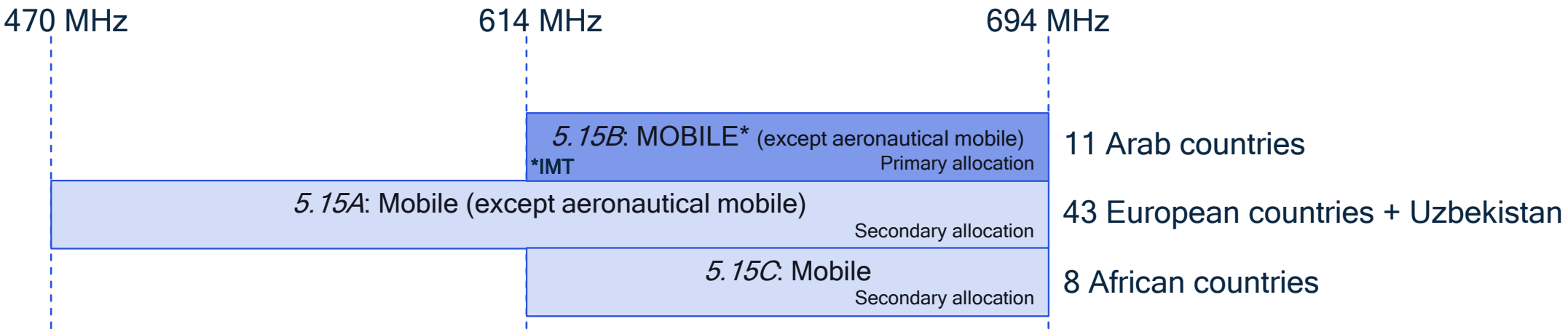
Agenda Items related to Mobile Spectrum and IMT Identification



WRC-23 outcome

470 – 694 MHz

WRC-23 Agenda Item 1.5



Further outcomes:

- Preliminary WRC-31 Agenda Item to review 470-694 Regulatory conditions and Mobile Allocations in 614-694 MHz for EU/RCC countries

Additional Highlights:

9 Region 3 countries + 10 Region 2 countries added to 610/614 – 698 Footnotes

3 300 – 3 400 MHz and 3 600 – 3 800 MHz

WRC-23 Agenda Item 1.2 and 1.3 (mid-Band)

3.3-3.4 GHz (R1 & R2)

- **Region 1**
  - IMT identification via a country footnote (total 49 countries, mostly African countries).
  - Primary Mobile allocation retained in Middle East
  - Europe and CIS (Commonwealth of Independent States) may not use this band for IMT due to existing radiolocation services (radars).
- **Region 2**
  - A mobile allocation and IMT identification for 3.3-3.4 GHz was agreed throughout Region 2 the administrations shall obtain the agreement of neighboring countries to protect operations within the radiolocation service.

3.6-3.8 GHz (R1 & R2)

- **Region 1**
  - A primary mobile allocation was agreed in 3.6-3.8 GHz throughout Region 1 with conditions in a footnote.
  - Conditions are similar to footnote 5.430A for 3.4-3.6 GHz. However, the application of provision 9.21 has been softened and this will only be applied if the pfd limit is exceeded.
  - The IMT identification was agreed through country footnote in 3.6-3.8 GHz in most countries in Africa and the Middle East and in 3.6-3.7 GHz in a few African countries.
- **Region 2**
  - The band 3.6-3.7 GHz was identified for IMT in Region 2, while a country footnote contains 15 countries identifying 3.7-3.8 GHz to IMT, with most restrictions removed - but requiring agreement with neighboring countries to protect FSS.

3300 – 3400 MHz band for R1 and R2

3600 – 3800 MHz band for R1 and R2

4 800 – 4 990 MHz

WRC-23 Agenda Item 1.1

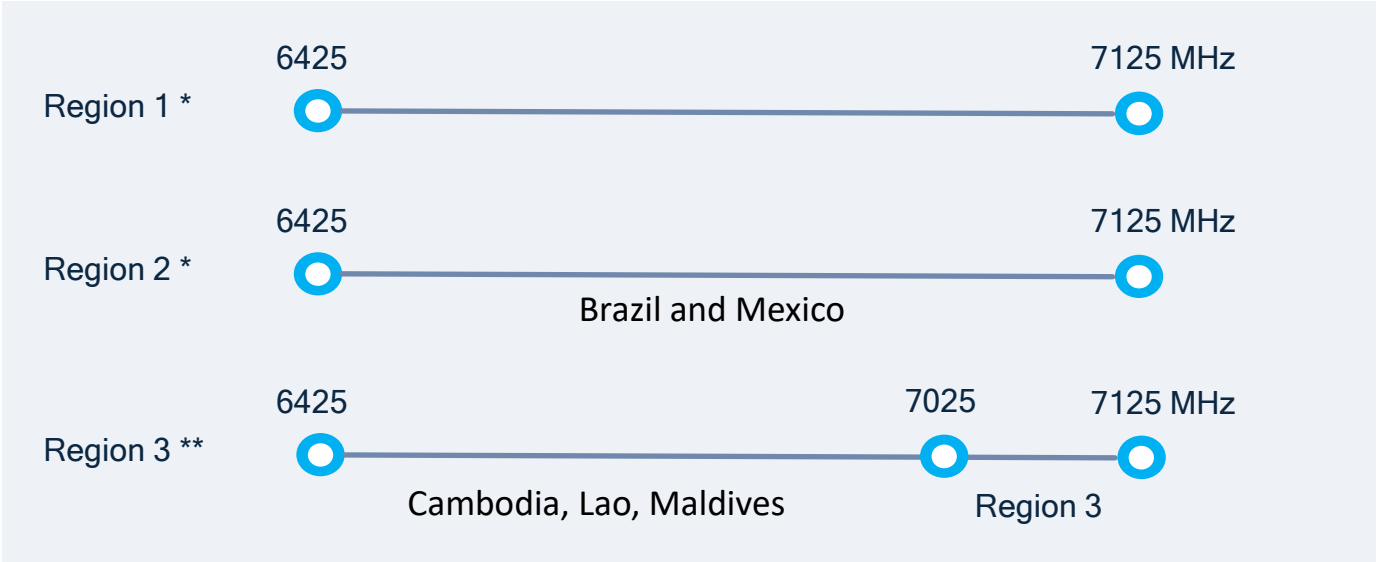
- This Agenda Item was very controversial during the 4 weeks of the Conference.
- Consensus was difficult (between NATO and Russia).
- Outcome: No Change
  - WRC23 decided to retain the regulatory and technical conditions in No. 5.441B unchanged in Resolution 223.
  - IMT -155 dB(W/(m2·1MHz)) at 20 km from the coast and the exemption list (resolves 5 of Resolution 223).
  - The Conference also decided not to continue further studies in this regard and decided to keep unchanged the list of 11 countries where the pfd limit does not apply.
  - Due to restricted pfd criteria coastal ATU countries opted out of 5.441B footnote. Several new countries added names to 5.441B for new IMT band to be licensed at national level

Key controversial point:

IMT on national territories to protect AMS/MMS stations in international airspace and waters

6 425 - 7 125 MHz

WRC-23 Agenda Item 1.2



Harmonised technical conditions - limits on the expected e.i.r.p. spectral density of IMT base-stations across all Regions for protecting FSS (Earth-to-space)

Vertical angle range θL ≤ θ < θH (vertical angle θ above horizon)	Expected e.i.r.p. (dBm/MHz)
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

*Other usages

The IMT identification footnotes include recognition that the frequency bands are also used for WAS/RLANs

**Linkage between Outcome of 6 GHz and WRC-27 Agenda Items

The WRC-27 AI 1.7 for IMT studies recognizes more countries can be added in the Region 3 country footnote in WRC-27 without additional studies

Key Highlights:

Harmonized technical conditions

10 - 10.5 GHz

WRC-23 Agenda Item 1.2

Mobile allocation and IMT identification in 10-10.5 GHz through a country footnote in Region 2.

"In the following countries in Region 2: Brazil, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, Guatemala, Jamaica, Mexico, Paraguay, Peru and Uruguay, the frequency band 10-10.5 GHz is identified for the implementation of the terrestrial component of International Mobile Telecommunications (IMT). The implementation of this identification in Mexico is subject to seeking agreement with the United States under No. ***9.21****. The use of the frequency band 10-10.5 GHz by IMT stations in the mobile service shall not claim protection from systems in the radiolocation service…"*

- The maximum e.i.r.p of BS is limited to 30 dB (W/100 MHz) to protect radio location and EESS active services.
- 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).
- The use of the frequency band 10-10.5 GHz for IMT is only intended for microcell base stations. (recognizing e)

Key issues and related outcome:

- Challenges from EESS active and passive services
- Power limits intended to allow for coexistence with radiolocation and EESS

Leveraging Key WRC-23 Decisions

New study item for 6G/IMT2030 spectrum

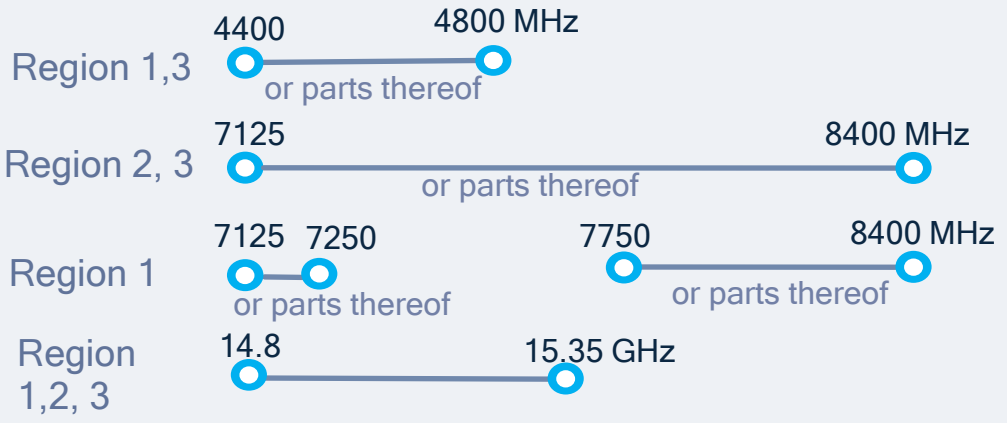
Candidate band proposals to WRC-23

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

WRC-23 Outcome

- Qualcomm prioritized 7125-8500 GHz
- Final decision on the bands were made in a closed-door meeting of heads of the regional organizations:
  - ATU, ASMG, CITEL , India strong vocal support
  - CEPT agreed to compromise on strong opposition
  - China compromised on strong opposition
  - USA silent (no vocal opposition)

A new WRC-27 Agenda Item 1.7 to study 4.4-4.8/7.125-8.4/14.8-15.35 GHz for 6G



Spectrum Bands Identified for IMT studies

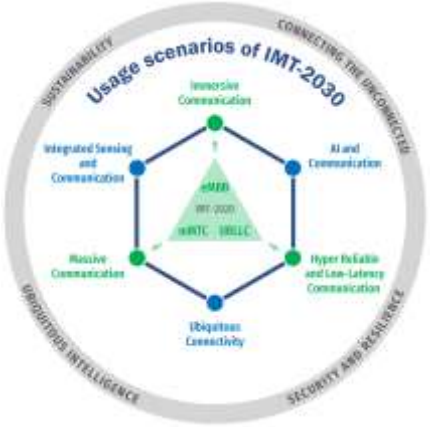
WRC-27 Agenda item 1.7

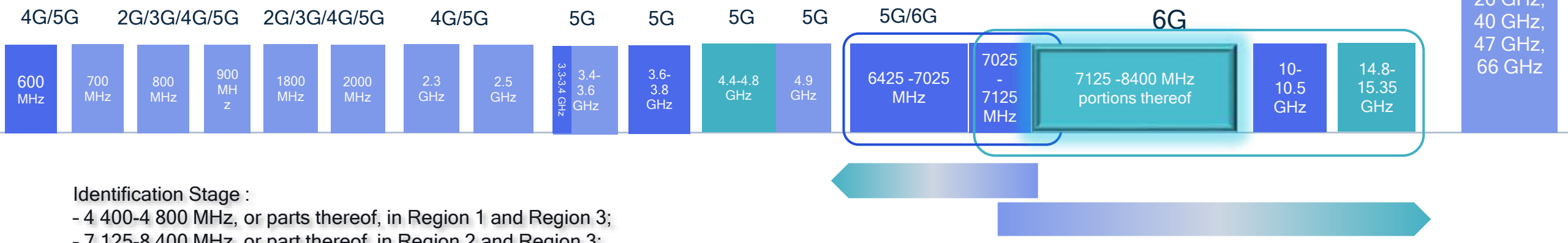
Administrations or Regions will study new candidate bands for use by 6G/IMT-2030, for decisions WRC-27.

WRC-27 Agenda Item 1.7 to study the use of IMT in the following bands:

- 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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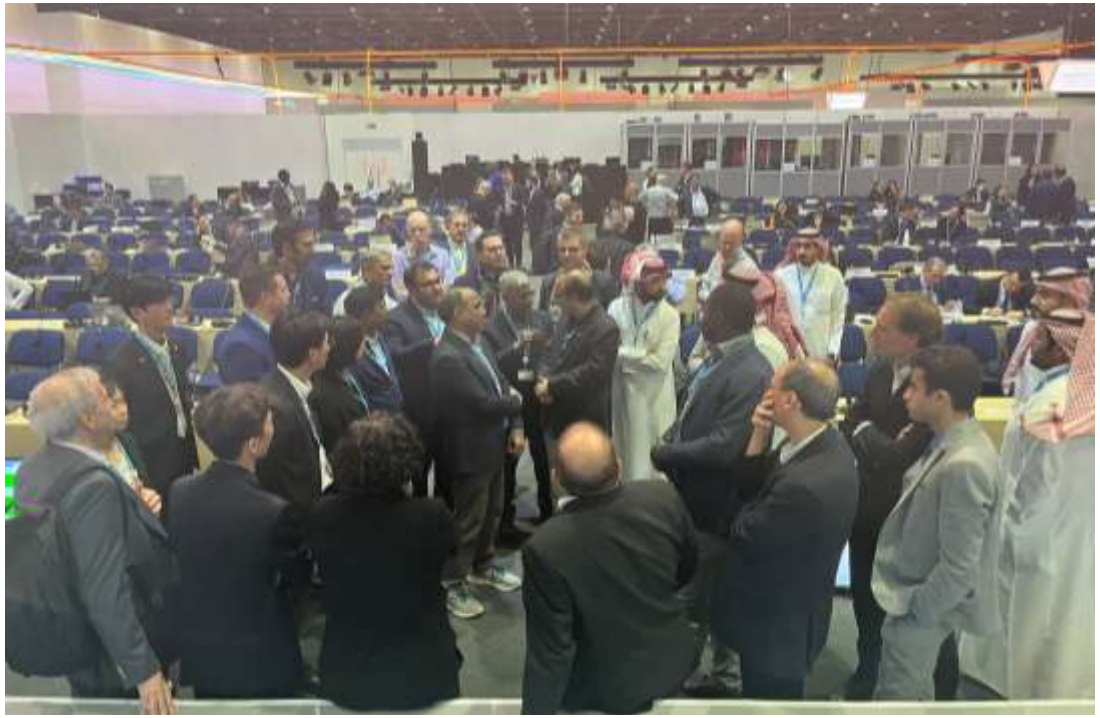

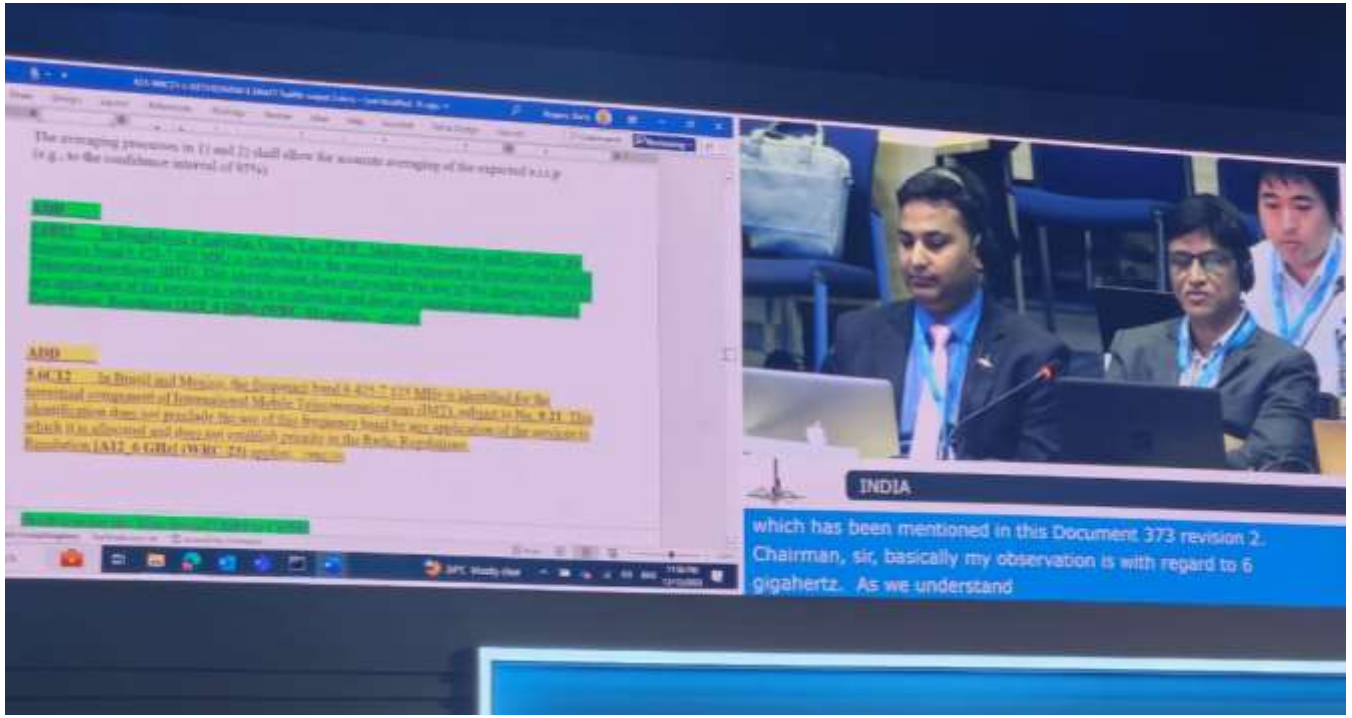
INDIA
which has been mentioned in this Document 373 revision 2.
Chairman, sir, basically my observation is with regard to 6
gigahertz. As we understand


IND
INDE


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Thank you

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