

The 26-28 GHz India 5G Spectrum Workshop
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ITU-R sharing studies and IMT-2020 standardization

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International Telecommunication Union

- Created in 1865, based in Geneva, 193 Member States, around 800 entities and academic institutions
- 12 regional offices, about 700 staff
- 3 ITU Sector:
 - ITU-R - Radiocommunications -> *global radio spectrum management and radiocommunication standardization*
 - ITU-T - Standardization -> *standardization of wireline networks, service aspects*
 - ITU-D – Development -> *assistance in the extension of ICTs to all the world's inhabitants, narrowing the digital divide*





ITU-R activities on IMT-2020/5G

Spectrum

- **Output:** mobile spectrum allocations and IMT identifications
- **Where:** Radio Regulations
- **By whom:** WRCs
- **Contributors:** ITU membership, ITU-R Study Groups, Regional Groups, International organisations
- **How:** Member States driven

IMT-2020 Standards

- **Output:** IMT-2020 Vision, overall requirements, RAN specifications
- **Where:** ITU-R Reports & Recs
- **By whom:** ITU-R Study Group 5
- **Contributors:** ITU membership, other standard making bodies
- **How:** Industry driven

ITU also develops harmonized channeling arrangements (Rec. M. 1036 of ITU-R WP 5D)



Spectrum activities



WRC



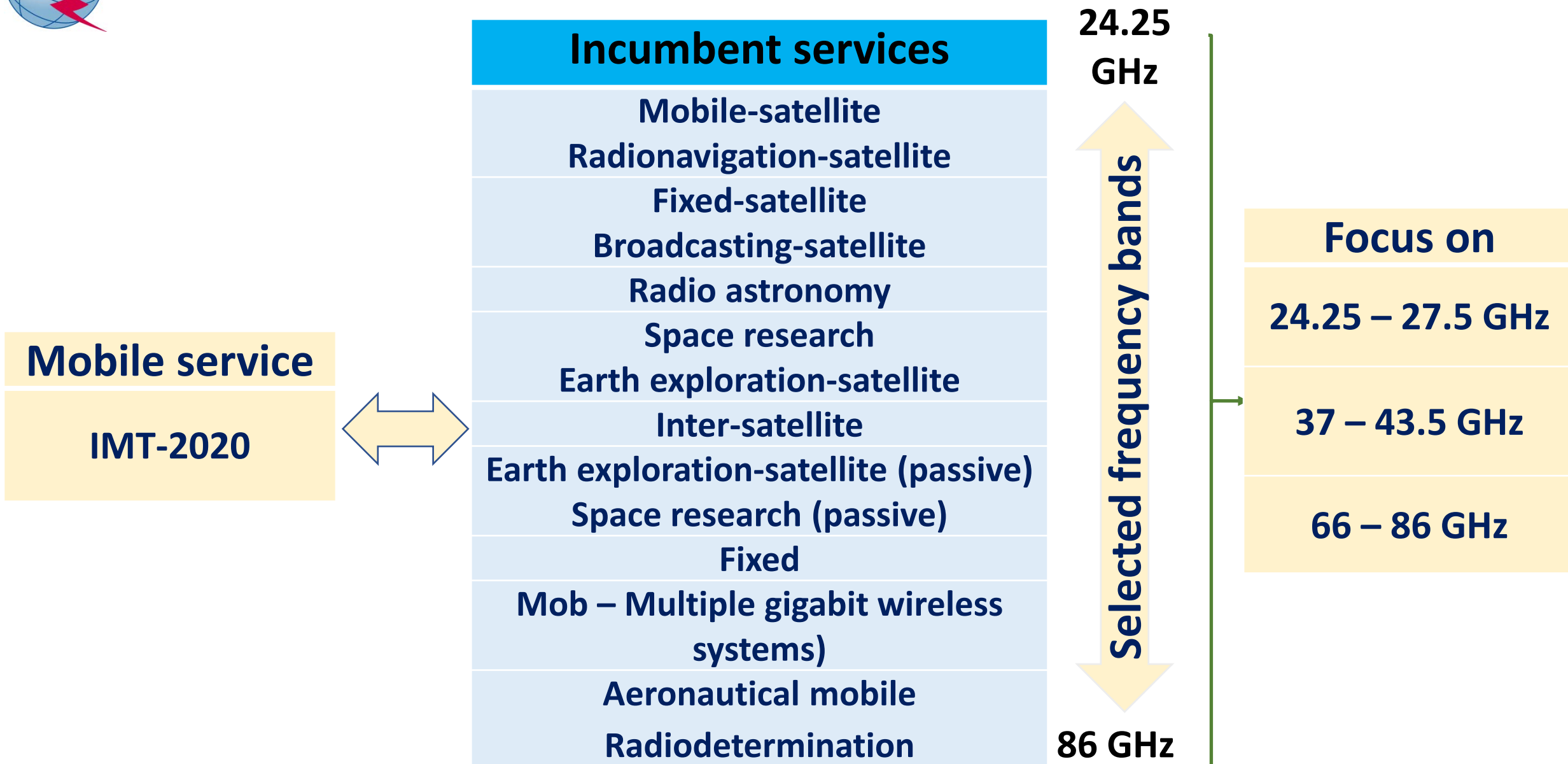


WRC key steps

- **Agenda** – determines the scope of studies
 - Agenda has a regulatory notion, it is stable and important
 - Agenda Item 1.13 “IMT above 24 GHz” considers 11 candidate bands
 - 28 GHz band was not included in AI 1.13 at WRC-15 -> no studies on this band
- **ITU-R Studies**- the heart of WRC preparations
 - Analysis of all sharing scenarios to keep interference within manageable limits
 - Development of sharing conditions, regulatory solutions
- **WRC** – allocates and identifies frequency bands, establishes sharing conditions
 - Satisfies spectrum requirement of emerging applications while protecting incumbent ones
 - Decisions are taken by consensus to ensure sustainability of future allocations



AI 1.13 objectives for sharing studies





Incumbent services in the band 26 GHz

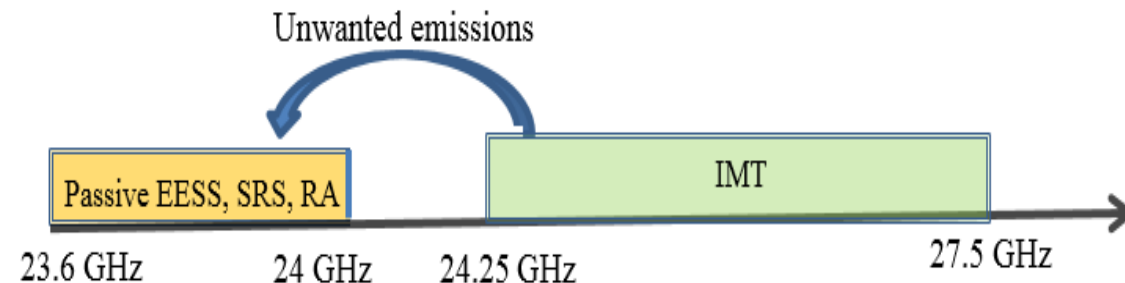
ITU-R Task Group 5/1 (05.2016 – 08.2018) finalized sharing studies of IMT in 26 GHz vis-a-vis:

Service	<u>Sym</u>	Band, GHz	Applications
Earth exploration-satellite (passive)	EESS	23.6 – 24	Passive sensors for meteorology and climatology
<u>Radioastronomy</u> (passive)	RA		Studying the universe (observations of ammonia, NH ₃)
Earth exploration-satellite (↓)	EESS	25.5 – 27	Transmissions from space sensors for environment monitoring
Space research (↓)	SRS	25.5 – 27	Transmissions from space sensors studying outer space
Inter-satellite	ISS	24.45 – 24.75 25.25 – 27.5	Tracking satellites and data relay
Fixed-satellite (↑)	FSS	24.65 – 25.25 27 – 27.5	Gateway ES, VSATs
Fixed	FS	24.25 – 27.5	FWA, Backhauling IMT, TVDS



Passive services in adjacent band 23.6 – 24 GHz

- **Possible interference:** unwanted emissions from IMT into the Radioastronomy and Earth exploration-satellite service (passive sensors)



- **Study results:**

- Protection of **RA**: separation distances of 9-70 km for BS and 5–27 km for UE -> **national issue**
- Protection of **EESS** by out-of-band emission limits on IMT, ranging :
 - BS: -55 to -32 dB(W/200 MHz)
 - UE: -51 to -29 dB(W/200 MHz)
- Protection of SRS is not needed: **no interference is expected**

Delicate balance: to protect EESS while avoiding heavy constraints on IMT



Sharing with EESS/SRS and ISS

- **Earth exploration-satellite (↓) and Space research services (↓):**
 - Sharing for both services can be ensured by exclusion zones around EESS and SRS earth stations
 - EESS earth stations can be protected by **separation distances 0.2 - 7 km**
 - Earth stations of SRS may require **separation distances 23.8 - 92 km**



- **Inter-satellite service:**
 - Results of studies: possible excess of interference up to +25 dB
 - Proposed solutions: angular e.i.r.p. mask for IMT base stations or TPR mask and the main beam not higher than 0 degrees



Sharing with FSS and FS

➤ Fixed-satellite service ↑

- Interference into satellite receivers: FSS is protected with sufficient margin
- Interference from earth stations (ES) to IMT receivers:
 - ES at known locations: protection of IMT by separation distances of 0.1 – 10 km -> sharing by coordination with neighbours
 - ES at unknown locations: the separation distance cannot be guaranteed -> to be dealt with on a case-by-case basis



➤ Fixed service:

- Sharing is feasible, need for separation and coordination with IMT
- Required separation distances are up to 70 km for co-channel and 12 km for adjacent channel operations



Primary services in 26 GHz and 28 GHz

Incumbent services 24.25 – 27.5 GHz	Incumbent services 26.5 – 29.5 GHz
EESS (passive)	-
<u>Radioastronomy</u> (passive)	-
EESS (↓)	EESS (↓), below 27 GHz
SRS (↓)	SRS (↓), below 27 GHz
Inter-satellite	Inter-satellite, below 27.5 GHz
Fixed	Fixed
“Traditional” FSS (↑)	“Traditional” FSS (↑)
-	High-density FSS (↑), above 27.5 GHz
-	Possible ESIMs in FSS (↑), above 27.5 GHz, AI 1.5



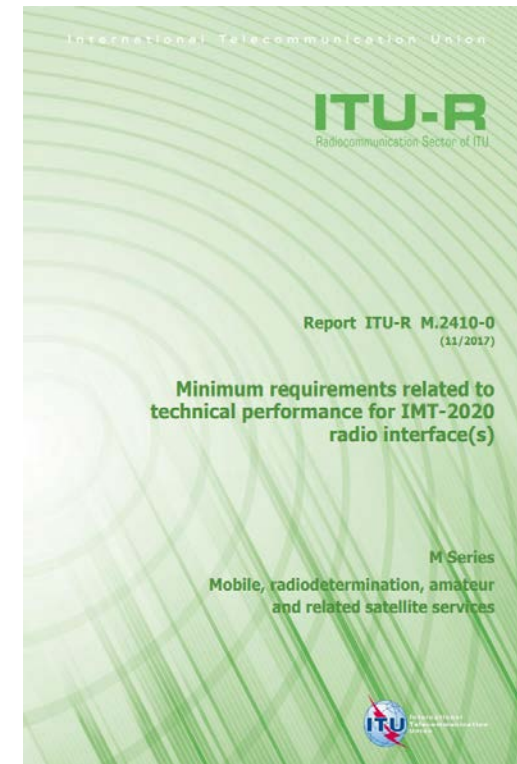
STANDARDIZATION ACTIVITIES



IMT-2020 standardization

- Detailed studies of IMT-2020/5G are conducted in ITU-R study groups, mainly WP 5D
- To date ITU developed: **IMT-2020 Vision** (Recommendation ITU-R M.2083) and **technical requirements** for its systems (Report ITU-R M. 2410)
- 2018 – July 2019 -> Submission of candidate radio interface technologies for IMT-2020, their analysis by independent evaluation groups
- October 2019 -> Consolidation of assessments in ITU WP 5D, consensus building and decision
- 2020 -> Detailed specification of the IMT-2020 standard
- Entire period 2017-2020: technical and market trials of 5G technologies, that will be contributing to the development of a detailed specification for IMT-2020

<http://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/imt-2020/Pages/default.aspx>





IMT-2020 standardization process

- ❖ Development plan
- ❖ Market/services view
- ❖ Technology/ research kick off
- ❖ Vision - IMT for 2020
- ❖ Name
- ❖ Process optimization

- ❖ Technical performance requirements
- ❖ Evaluation criteria
- ❖ Invitation for proposals
- ❖ Sharing study parameters (IMT-2020)
- ❖ Sharing studies in preparation for WRC-19

- ❖ Technical proposals
- ❖ Evaluation Groups
- ❖ Methodology
- ❖ Consensus building

- ❖ Decision & radio framework
- ❖ Detailed IMT-2020 radio specifications
- ❖ Future enhancement/ update plan & process

IMT-2020 spectrum allocation process

- ❖ < 6 GHz spectrum allocations and identification
- ❖ ITU-R Study Group activities/studies
- ❖ Spectrum/band arrangements (post WRC-15)

- ❖ CPM Report on IMT to WRC-19
- ❖ > 24.25 GHz allocations and identification
- ❖ Spectrum/band arrangements (post WRC-19)

2012-2015

2016-2017

2018-2019

2019-2020

Setting the stage for the future:
vision, spectrum, and technology views

Defining the technology
Allocate the spectrum



Thank you!