

4th India Spectrum Management Conference 2024 (ISMC-24)

Session 3: 2:00 PM - 3:30 PM Developing the
Spectrum Roadmap for Growth of 4G, 5G, and
6G Mobile Services in India

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Allocated Radio-frequency Bands to TSPs via Auction (Year 2022)

Band	Paired/ Unpaired	Uplink frequency (MHz)	Downlink frequency (MHz)	Total band auctioned
600 MHz	Paired	663-703	612-652	230 MHz (Low band)
700 MHz		718-748	773-803	
800 MHz		824-844	869-889	
900 MHz		890-915	935-960	
1800 MHz		1710-1765	1805-1860	
2100 MHz	Unpaired	1939-1979	2129-2169	680 MHz (Mid band)
2300 MHz		2300-2380		
2500 MHz		2535-2555 and 2635-2655		
3300 MHz		3300 -3670		
26 GHz		24250 -27500		
Total				3930

Identified Radio-frequency Bands to IMT (Globally) in the RR

Frequency range	RR footnote	Bandwidth (MHz)	BW in Low, Mid & Higher band (MHz)
450-470 MHz	5.286AA	20	190 (Low)
790-960 MHz	5.317A	170	
1 427-1 452 MHz	5.341A,B,C	25	746 (Mid)
1 492-1 518 MHz	5.341A,B,C	26	
1 710-1 885 MHz, or portions thereof	5.384A	175	
2 300-2 400 MHz, or portions thereof	5.384A	100	
2 500-2 690 MHz, or portions thereof	5.384A	190	
1 885-2 025 MHz	5.388	140	
2 110-2 200 MHz	5.388	90	
24.25-27.5 GHz	5.532AB	3250	14750 (Higher)
37-43.5 GHz, or portions thereof	5.550B	6500	
66-71 GHz	5.559AA	5000	
Total			15686

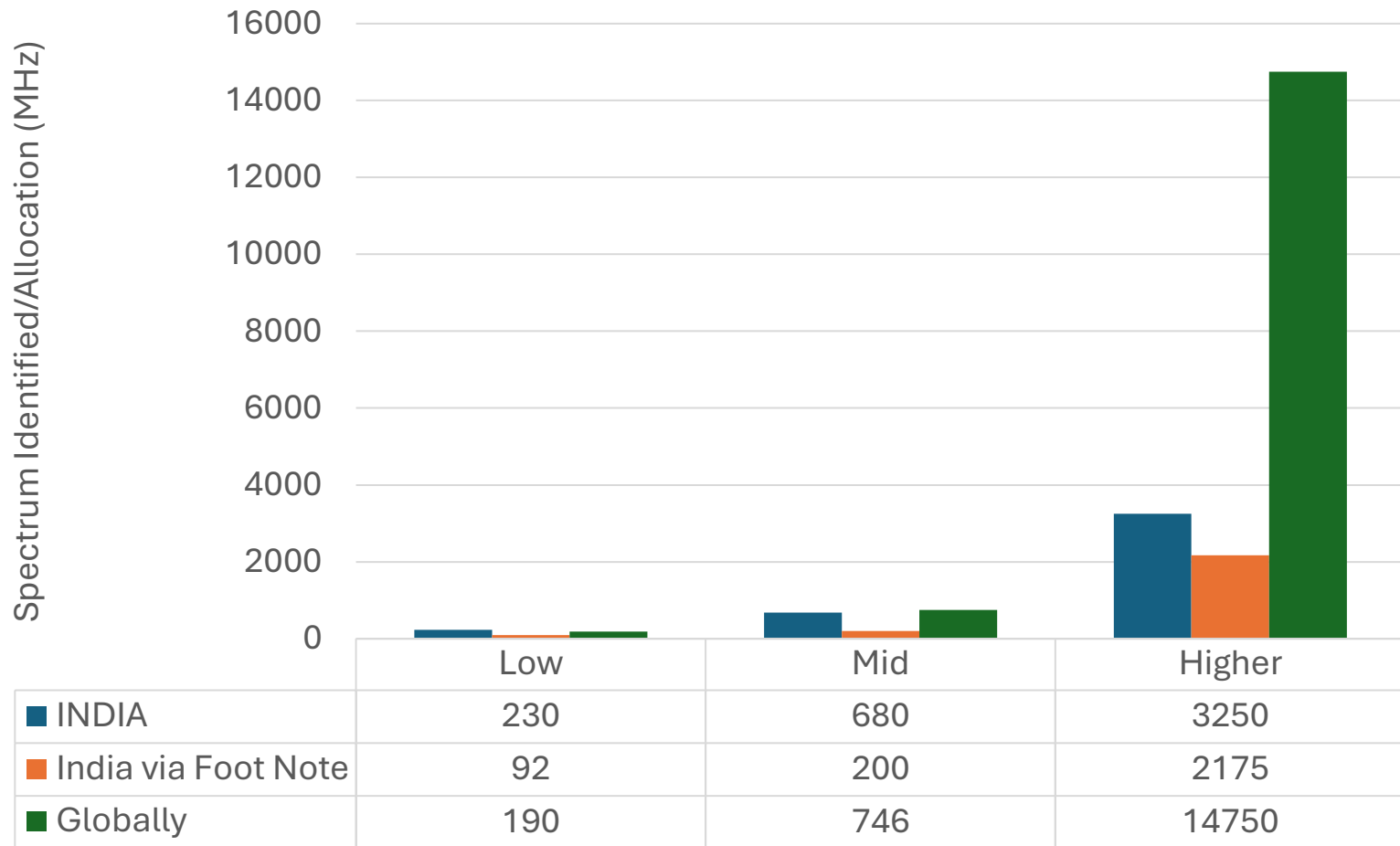
Identified Radio-frequency Bands via India specific footnote in the RR.

698-790 MHz, or portions thereof	5.313A	92	92 (Low)
3 300-3 400 MHz	5.429F	100	200 (Mid)
3 500-3 600 MHz	5.433A	100	
47.2-48.2 GHz	5.553B	1000	2175 (Higher)
7 125-8 400 MHz, or portions thereof*	WRC27	625	
14.8-15.35 GHz	WRC27	550	

Total

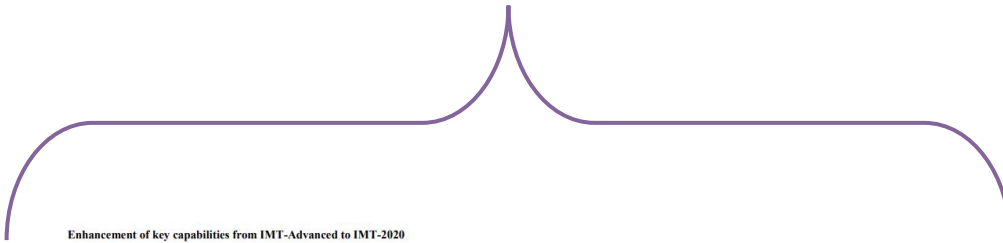
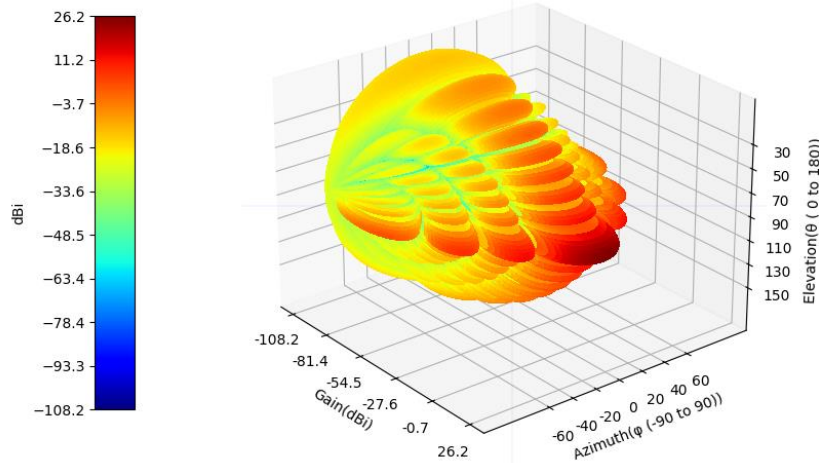
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Identified IMT Spectrum and Allocation

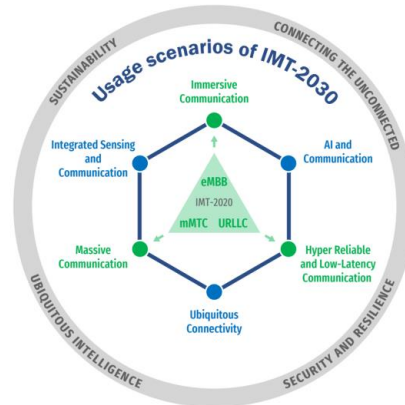
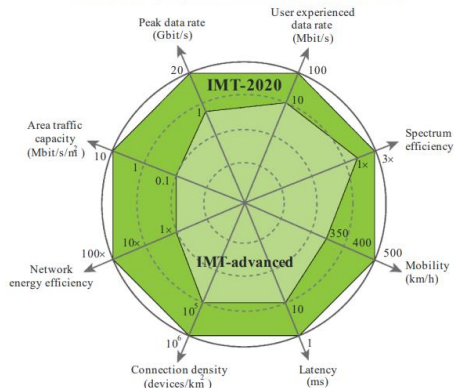


Beamforming technique and its importance

AAS Composit Radiation Pattern (beta = 0, $\theta_{\text{tilt}} = 0.01$, $\phi_{\text{escan}} = 0.01$)



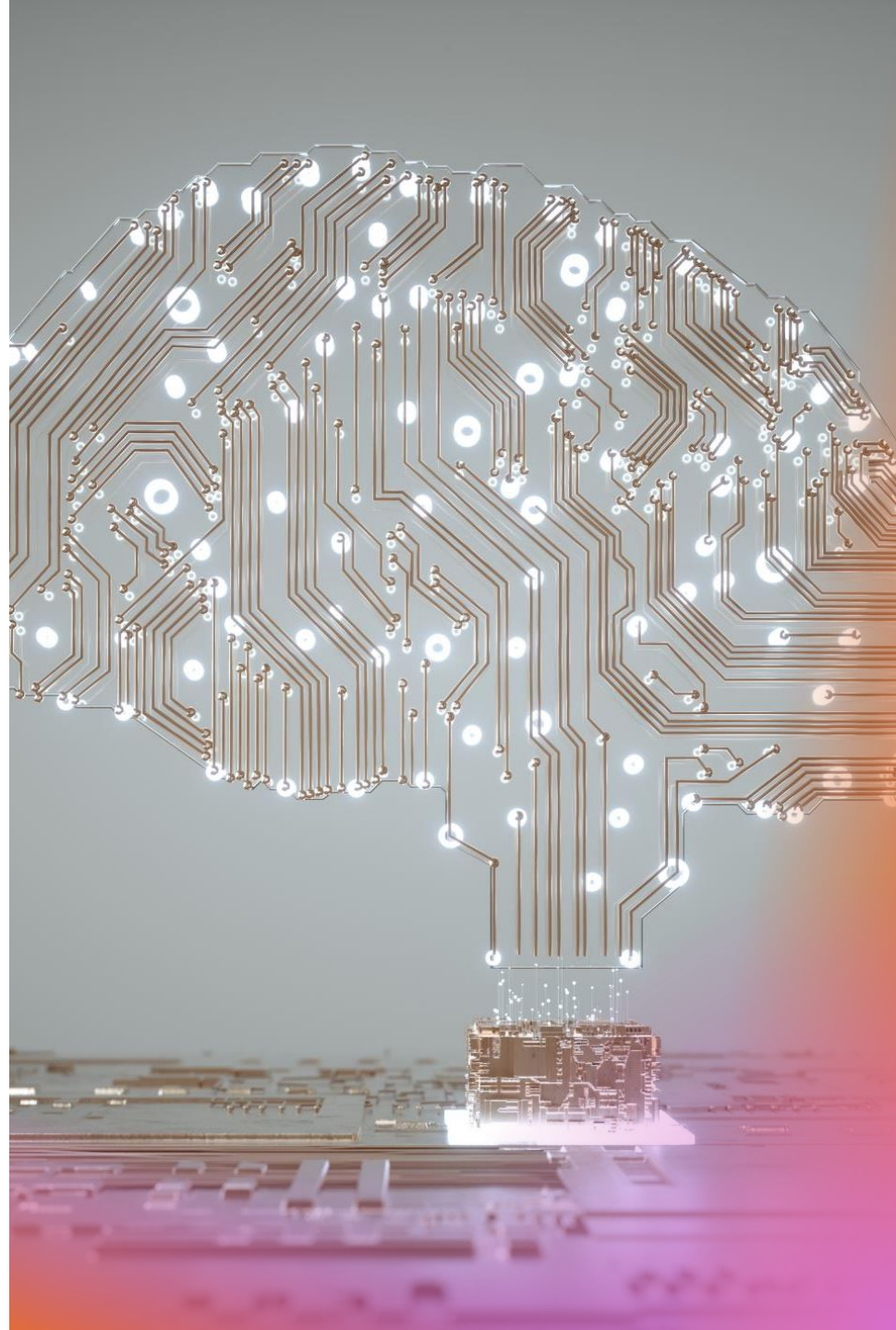
Enhancement of key capabilities from IMT-Advanced to IMT-2020



4G	5G	6G
User experience data (MBPS)		
10	100	300-500
Latency (ms)		
10	1	0.1-1
Spectrum effi (bps/hz/cell)		
1x	3x	(4.5-9)x
Area Traffic Capacity (MBPS/m ²)		
.1	10	30-50

IMT 2030 and beyond, New Capabilities

- **1. Necessity of Artificial Intelligence and Machine Learning (AI/ML)**
 - Increase in Base Stations
 - Distributed data storage
 - Distributed computing
 - Edge computing
- **Example:**
 - Deep learning Neural (Characterization of traffic, interference, user behavior etc)to optimize Radio resource.

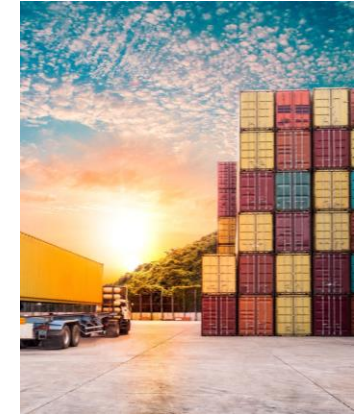
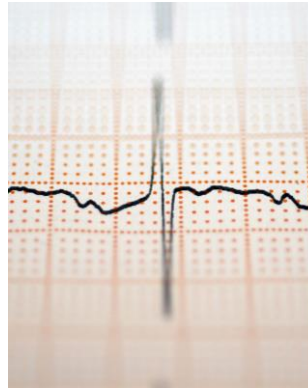
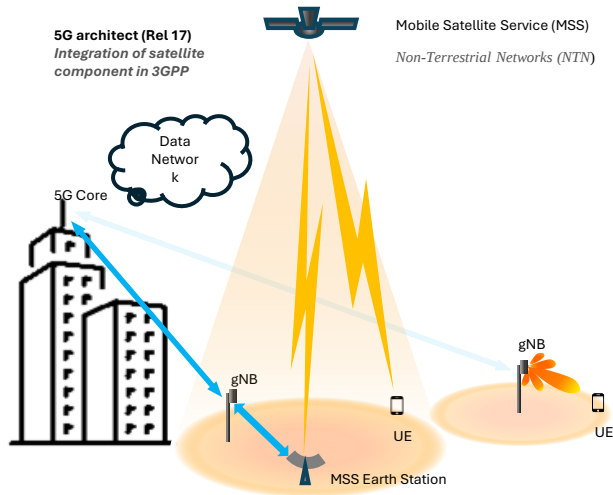




IMT 2030 and beyond, New Capabilities

- **2. Sensor**

- Sensing data may be helpful in accurate beamforming toward intended receivers
- Sensing radio environment may be helpful to deal with interference
- Beam failure recovery in case of obstacle between Tx and Rx
- Extremely immersive XR and holographic communications.
- Digital twins
- Robots (Haptic/Tactile sensor)
- Driver Less Cars



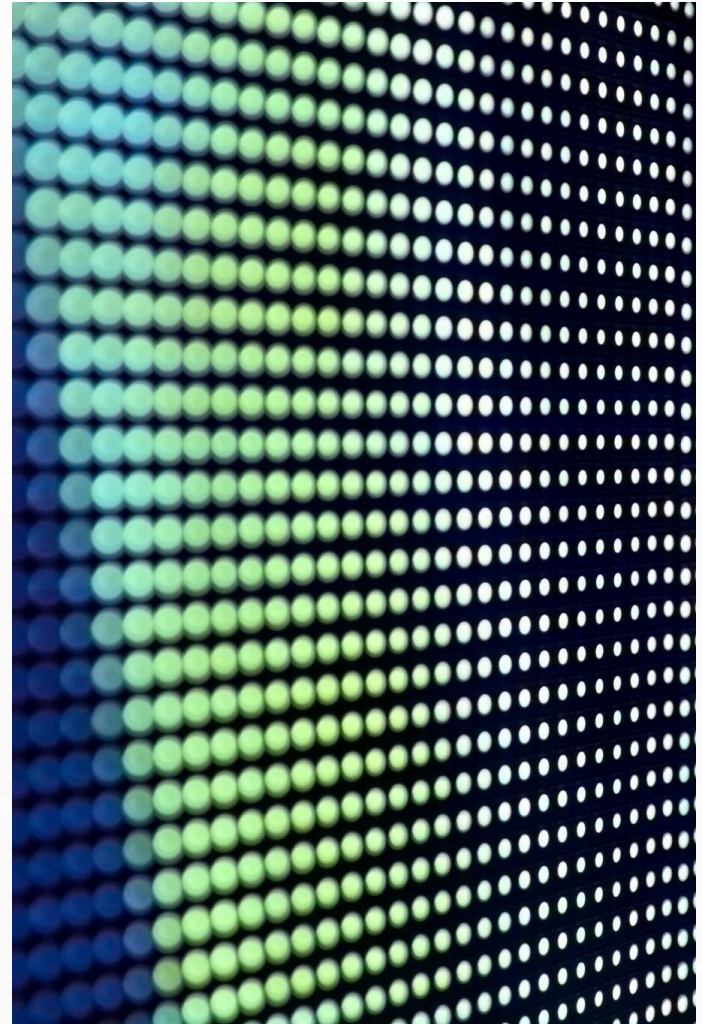
IMT 2030 and beyond, New Capabilities

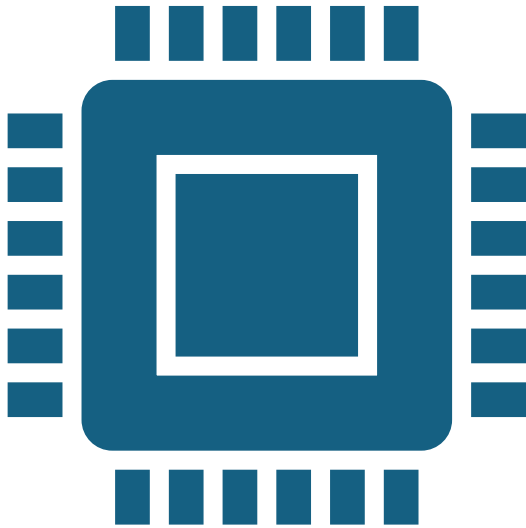
- **3. Ubiquitous connectivity**
 - Coverage
 - Access to : Education, health, agriculture, transport, logistics and business opportunities.



Radio Frequency Spectrum requirement

Low, Mid, High upto
THz





Thank you

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