



Twenty Eighth National
Conference on Communications



Workshop on “Standards Driven Research” at NCC 2022

24 May 2022, 1000-1700 IST



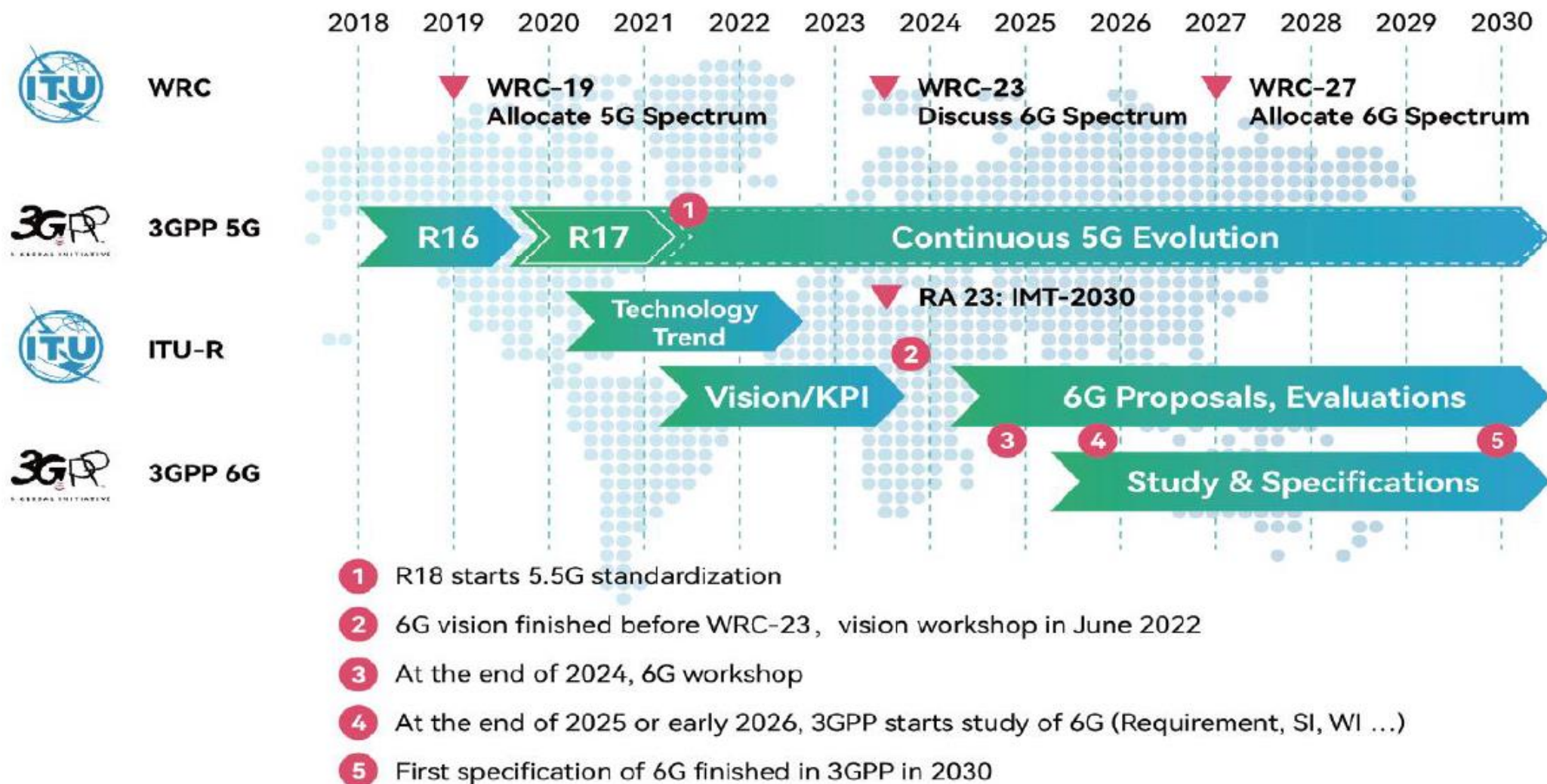
Workshop on “Standards Driven Research” at NCC 2022

Technology Enablers for 6G

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JOURNEY FROM 5G to 6G



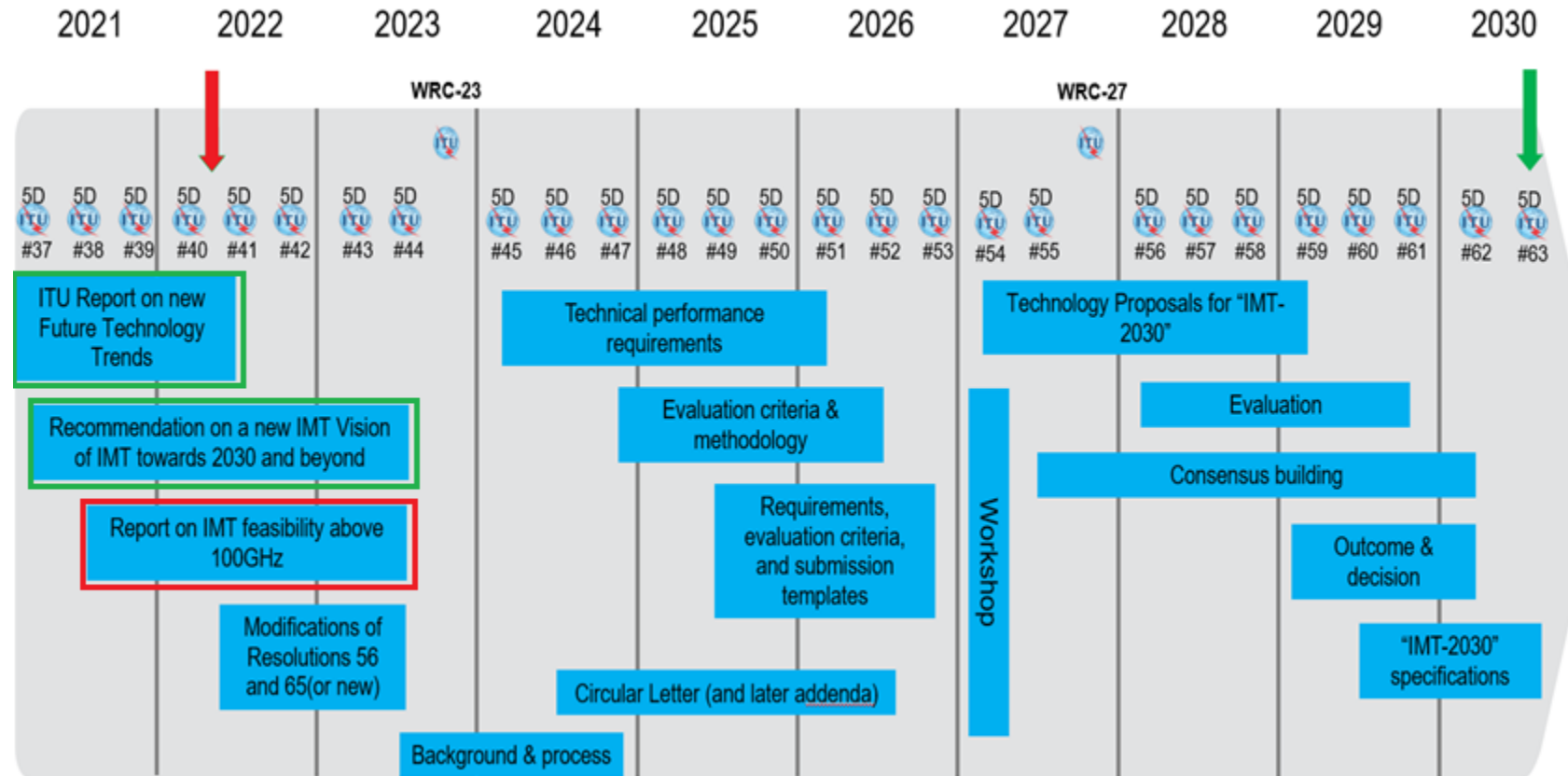
TSDSI SG-N SI#70

Use cases, Requirements & Candidate technologies for 6G

- SG-N Study Item #70 aims to contribute Indian perspective on IMT-2030 to ITU-R. Following contributions were submitted -
 1. Document 5D/TEMP/320, Draft working document towards a preliminary draft new Report ITU-R M.[IMT.FUTURE TECHNOLOGY TRENDS OF TERRESTRIAL IMT SYSTEMS TOWARDS 2030 AND BEYOND]
 2. Document 5D/TEMP/273, [Draft] detailed workplan for the development of preliminary draft new Recommendation ITU-R M.[IMT.VISION 2030 AND BEYOND]
- It plans to lay a path towards joint research and development efforts between Indian academia & industry by identifying key features towards future technology evolution.
- The study also aims to aid national decision-making bodies to prepare for future telecom trends.

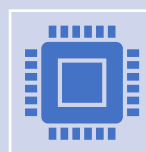
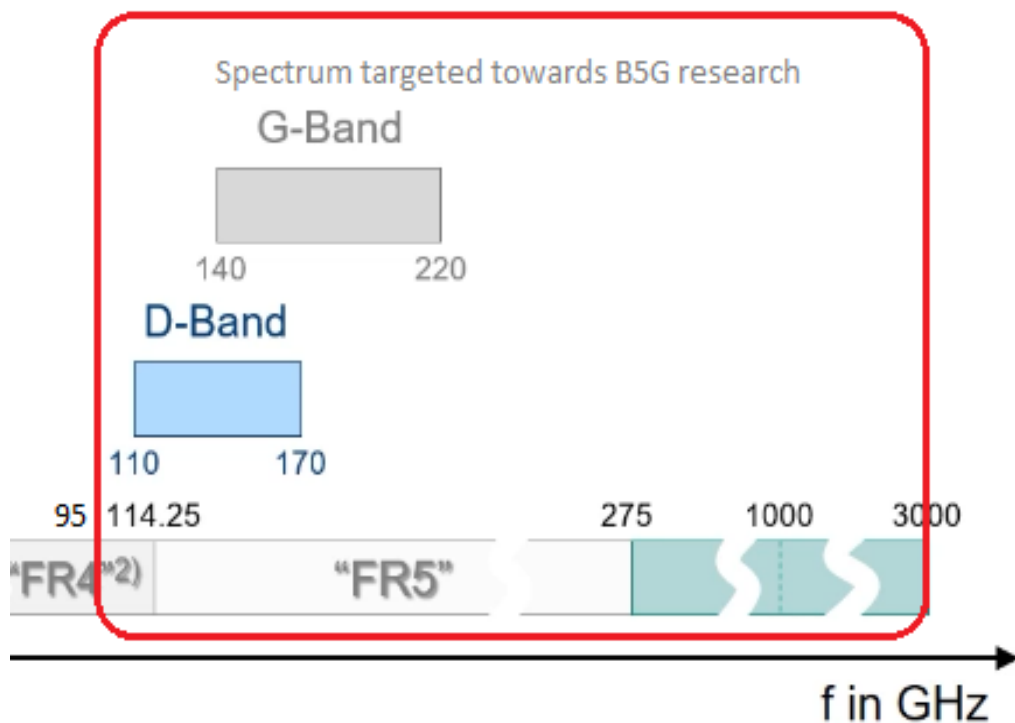
TSDSI SG-N SI#70: ITU IMT2030

- The discussion on 6G Vision & Use cases in ITU-R started from Feb. 2021, and the report will be ready in June 2023.
- TSDSI SI#70 captures the preliminary understanding on 6G Use cases, enabling technologies, KPIs, Network architecture, spectrum views
- TSDSI made contributions towards the Vision document & technology trends [1] document based on the interim outcome of this study.



[1] Report ITU-R M.[IMT.FUTURE TECHNOLOGY TRENDS TOWARDS 2030 AND BEYOND] – Future technology trends of terrestrial IMT systems towards 2030 and beyond

NEW SPECTRUM & REGULATIONS



Attaining data rates of the order of 100 Gbps require usage of wider bandwidth available in higher frequency bands.



Such initiatives would call for new regulatory models to be implemented.



Some geographies have opened spectrum above 100 GHz encouraging early experimentation in sub-THz bands



WRC 6G spectrum discussions

- For higher ranges, WRC-19 Resolution 731 states -
 - a. It is noted that Resolution 731 (Rev. WRC 19) contains the following:
 - i. “invites the ITU Radiocommunication Sector
 - 1) to continue its studies to determine if and under what conditions sharing is possible between active and passive services in the frequency bands above 71 GHz, such as, but not limited to, 100-102 GHz, 116-122.25 GHz, 148.5-151.5 GHz, 174.8-191.8 GHz, 226-231.5 GHz and 235-238 GHz;
 - 2) to conduct studies to determine the specific conditions to be applied to the land mobile and fixed service applications to ensure the protection of EESS (passive) applications in the frequency bands 296-306 GHz, 313-318 GHz and 333-356 GHz”.



AI – ML DISRUPTION

- AI/ML can bring the next paradigm shift in Future wireless networks design.
- Potential to impact EDGE , DEVICE, ACCESS, CORE domains
 - > AI / ML in 6G Wireless systems
 - > Desired attributes of wireless datasets

Indian Eco-system:

- AIRAWAT AI Research, Analytics and knowledge Assimilation platform
- Leading-edge AI computing technology platform, thus
- Enabling the key players to bring an AI revolution in the country

RE-ENGINEERING 5G DESIGN ELEMENTS FOR 6G

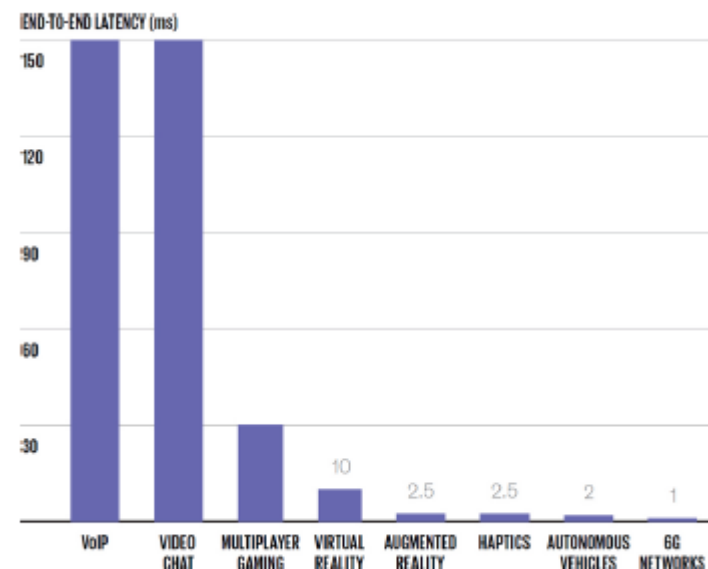
Sub-THz Band Operation

Fundamental issues limit the usage of current technology in sub-THz bands

Redesign: RF FE, PHY (Waveforms, Massive MIMO), CODECS, MAC

E2E Latency below 1 millisecond

PHY, CODECS, TCP, OPTICAL,



Sources: ITU; TechTarget, British Exports, Association; GSMA



Green Communication Tech for 6G

describes the use of technology and science to reduce human impacts on the natural environment ...

- PHY/MAC layer algorithms for supporting resource-constrained devices in 6G such as cell-free massive MIMO, ultra-small cells, full duplex and terahertz communication
- Adaptive waveforms, battery-less energy harvesting, and adaptive modulation and coding techniques for low-power 6G networks
- Novel techniques and receiver architectures for RF energy harvesting and simultaneous wireless and information transfer in 6G networks
- Energy and spectral efficient radio transceivers and access technologies for 6G networks
- Ambient backscatter communications, symbiotic radio and reconfigurable intelligent surfaces for 6G green networks
- AI/ML techniques for green communications and computing in 6G networks
- Energy efficient edge/fog computing, task/data/computation offloading and cloud-assisted resource management for green IoT networks



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