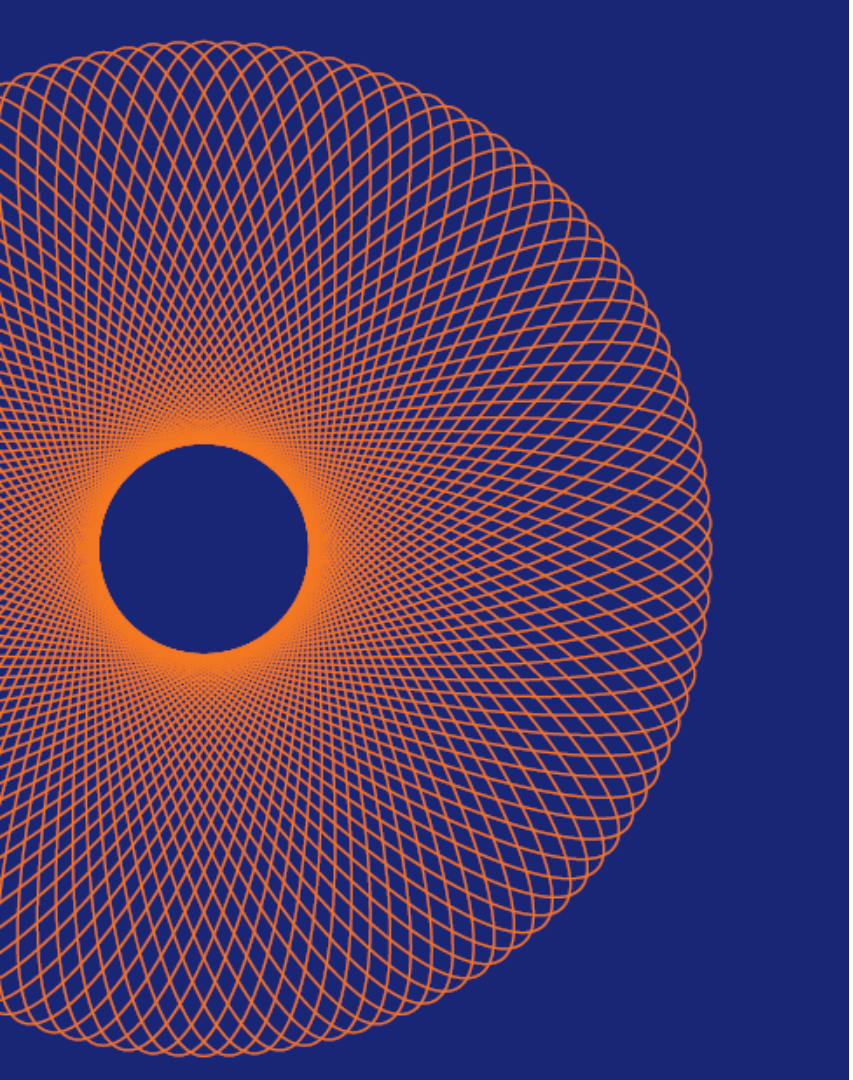


SAMSUNG

6G

The Next Hyper-Connected Experience for All.

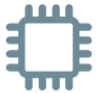
Dr. Dan Warren

Director, Advanced Network Research

Samsung Research, Samsung Electronics

Connected Machines – Machines as Main Users

- New form-factor devices: AR glasses, VR headsets, and hologram devices
- 500 billion devices will be connected by 2030, including vehicles, robots, home appliances, etc.

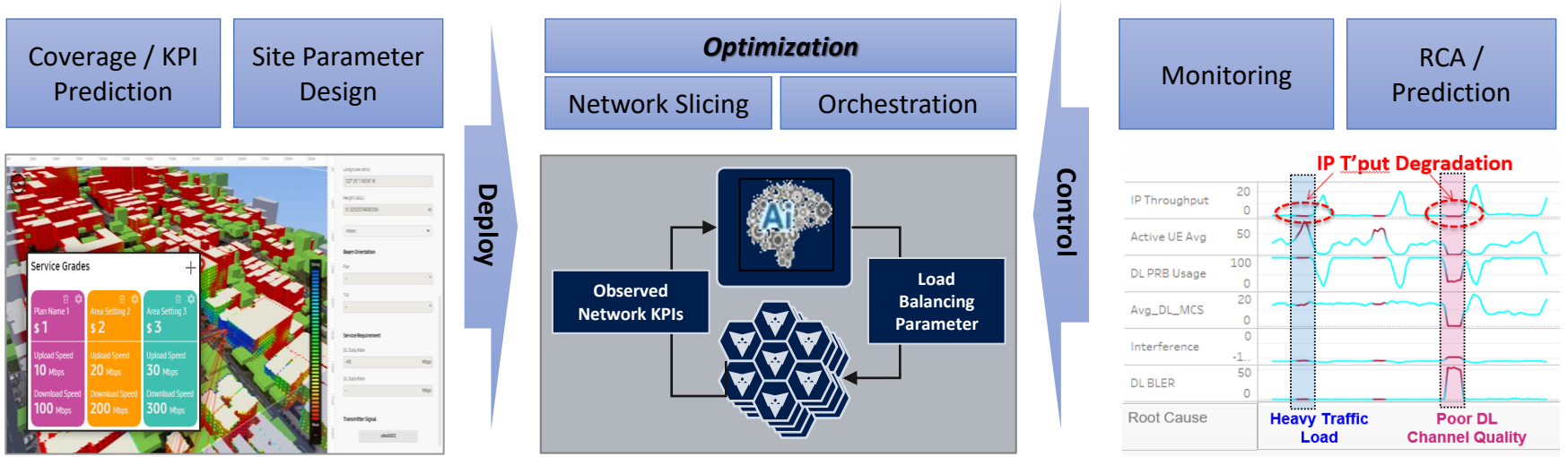


500 billion machines (59x World Population) >> 8.7 billion people

	Human	Machine
Maximum Resolution	1/150° (Smartphone display 290 ppi at 30 cm)	Exceeds Human Limitations!
Latency Perception	<100 ms	
Audible Frequency	250-20,000 Hz	
Visible Wavelength	280-780 nm	
Viewing Angle	Azimuth 200°, Zenith 130°	

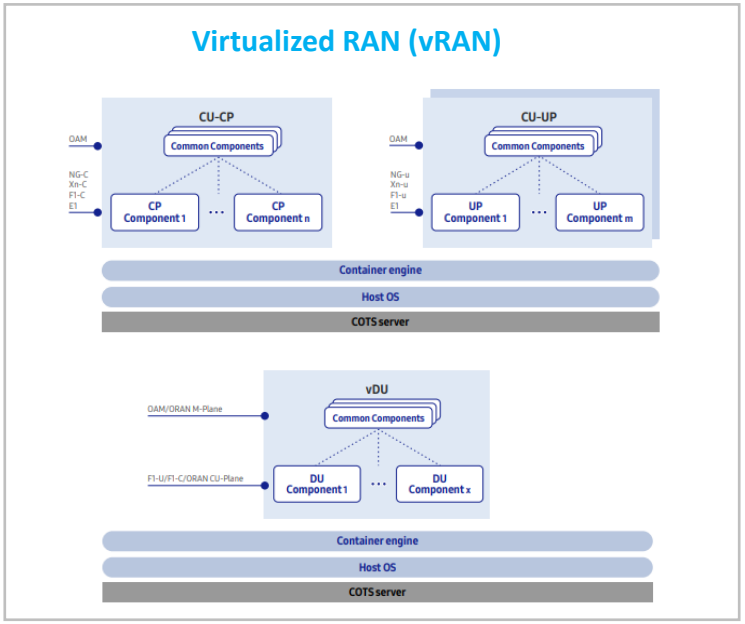
AI/ML – New Tool for Wireless Communications

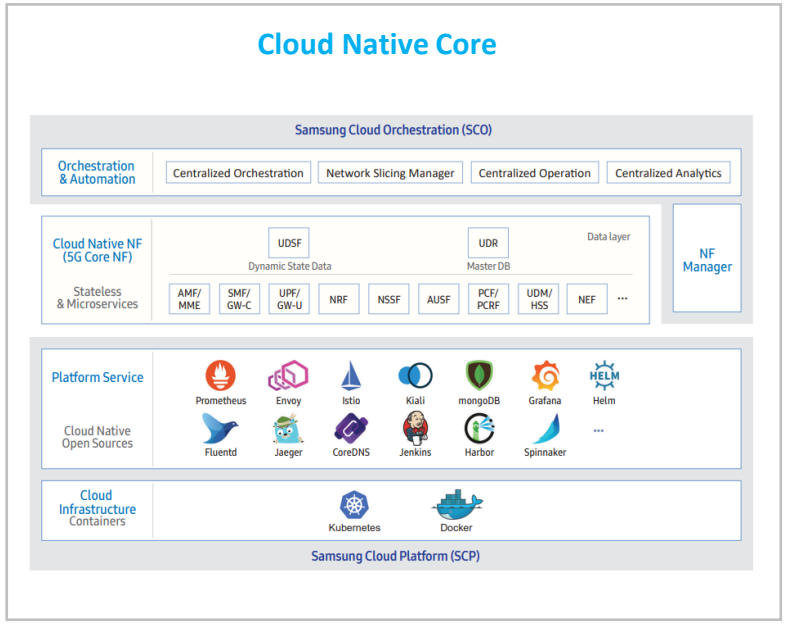
- Reduces capital expenditure (CAPEX) and operational expenditure (OPEX)
- Improves overall performance, such as network optimization, reduction of network energy consumption, massive data processing, etc.



Softwarization, Virtualization, and Cloudification of Networks

- Software-based implementation of networks thanks to performance improvement of CPUs
- vRAN is already becoming a major approach for implementing 5G RAN

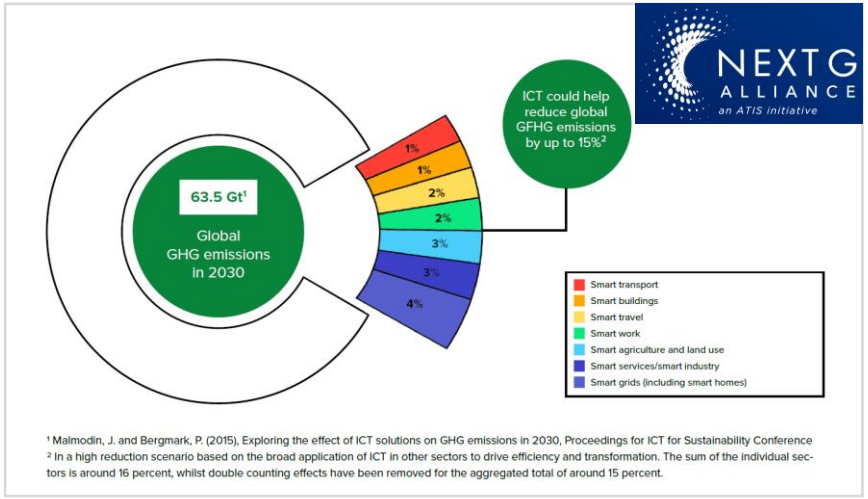




Megatrends towards 6G (4)

Clean Technology for Sustainability

- Evolves not only to improve performance but also to minimize environmental pollution
- Contributes to delay climate change by innovatively reducing global GHG emissions via energy consumption minimization



Green G: The Path Toward Sustainable 6G, Next G Alliance, Jan. 2022

The Next Hyper-Connected Experience for All.

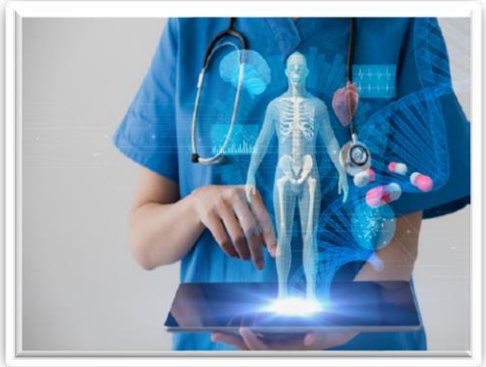
Truly Immersive XR

* eXtended Reality

- Sufficient wireless capacity to be secured for higher data rate to realize Virtual Reality, Augmented Reality, Mixed Reality, etc.

High-fidelity Mobile Hologram

- Next-generation media technology presenting gestures and facial expressions by means of a holographic display



Digital Replica

- Replicate physical entities and interact with them in a virtual world without temporal or spatial constraints

Key Enablers

Spectrum

- Low band
- Lower mid-band
- Upper mid-band
- Sub-THz / mmWave
- Unlicensed band
- Spectrum sharing

Radio Technology

- Extreme MIMO
- THz Communications
- mmWave – 2nd generation
- Advanced Duplex
- RIS (Reconfigurable Intelligent Surface)
- LoS MIMO (e.g., OAM)
- Joint Comm. & Sensing, Positioning
- Near-Zero Energy Communications
- Waveform, Coding, and Modulation
- BS/UE Energy Saving

Network Architecture

- Comm. & Computing Integration
- System for Distributed Cloud
- RAN-CN Architecture

AI-Native System

- AI-Native Air Interface
- Distributed Intelligence
- Split/Federated Learning

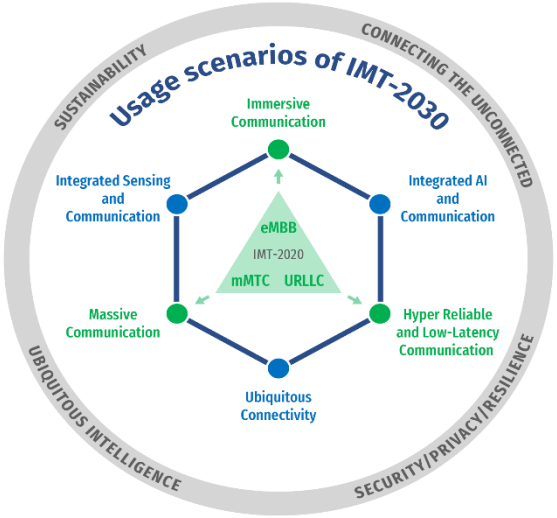
Trustworthy System

- Secure Identities & Protocols
- Resilience
- Reliability
- Quantum Safety

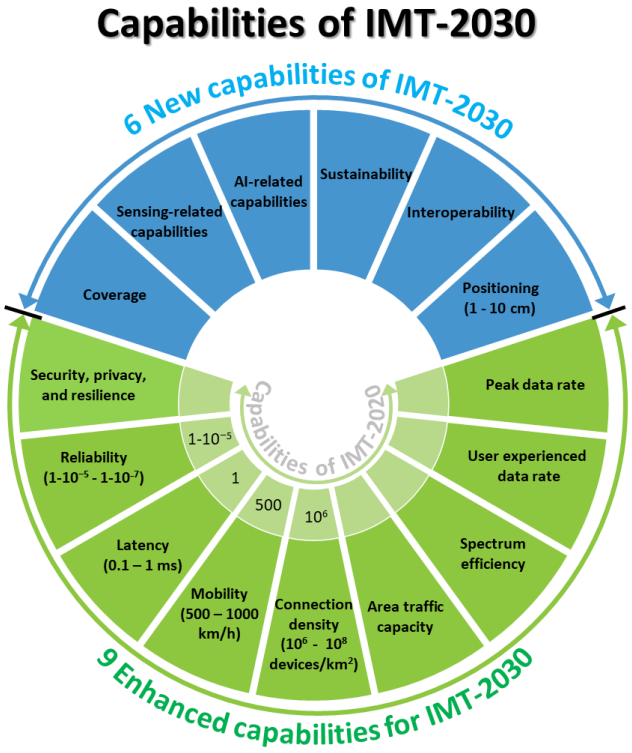
Other Critical Aspects

- Green Network
- Cost-efficiency
- Migration from 5G to 6G

ITU-R 6G/IMT-2030 Usage Scenarios & Capabilities



"6G Wheel"



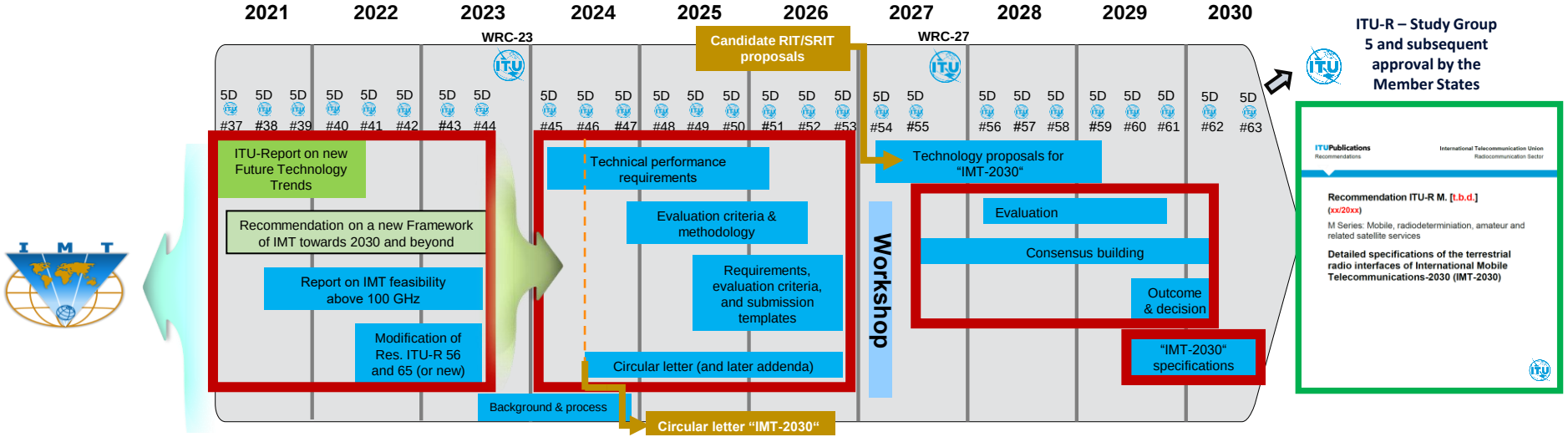
The range of values given for capabilities are estimated targets for research and investigation of IMT-2030.

All values in the range have equal priority in research and investigation.

For each usage scenario, a single or multiple values within the range would be developed in future in other ITU-R Recommendations/Reports.

- Extension from IMT-2020 (5G)
  - eMBB → Immersive Comms
  - mMTC → Massive Comms
  - URLLC → HRLLC (Hyper Reliable & Low-Latency Comms
- New for IMT-2030 (6G)
  - Ubiquitous Connectivity
  - Integrated AI & Comms
  - Integrated Sensing & Comms
- Overarching aspects: act as design principles commonly applicable to all usage scenarios
  - Sustainability, Connecting the unconnected, Ubiquitous intelligence, Security / privacy / resilience

ITU-R 6G/IMT-2030 timeline



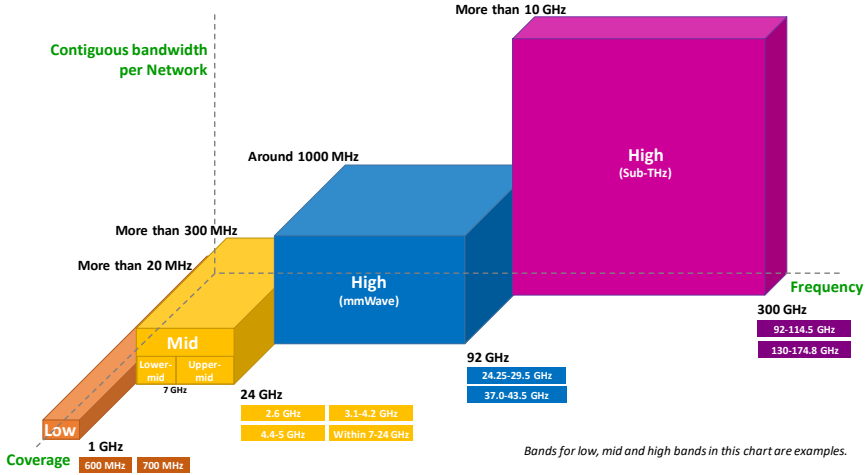
Note 1: WP 5D #59 will additionally organize a workshop involving the Proponents and registered Independent Evaluation Groups (IEGs) to support the evaluation process
Note 2: While not expected to change, details may be adjusted if warranted. Content of deliverables to be defined by responsible WP 5D groups

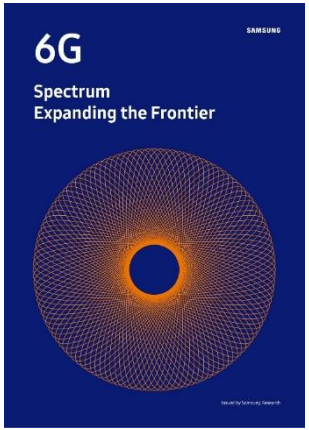
Framework → **Requirements and Evaluation criteria** → **Evaluation and Consensus building** → **Specification** → **Approval**

6G Spectrum: Expanding the Frontier

6G spectrum should be secured for commercialization around 2030

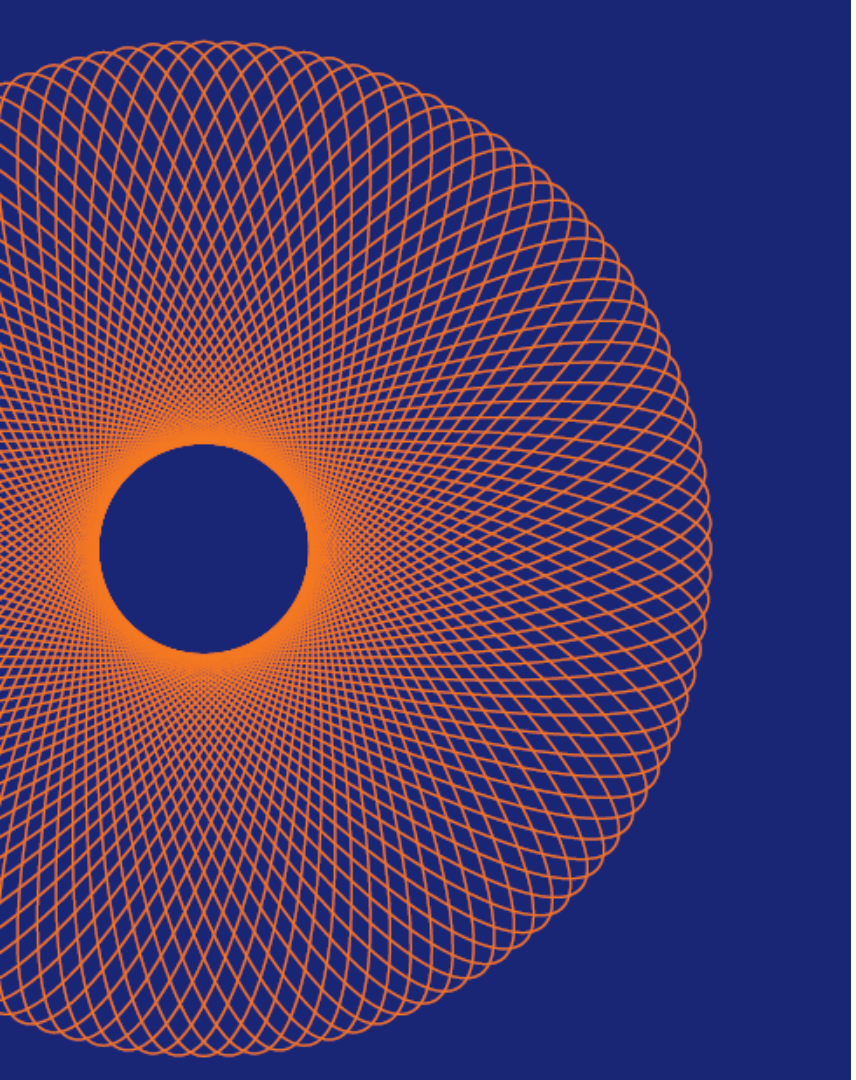
- Various services and applications require utilization of spectrum in low, mid, and high bands
- New spectrum for 6G: upper mid-band (7-24 GHz) and sub-THz band (92-300 GHz)
- Selective use of spectrum in a flexible manner to use limited frequency resources efficiently
- Need consideration on both technical & regulatory approaches for 6G





Samsung 6G Spectrum White Paper

(https://research.samsung.com/next-generation-communications)



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The Next Hyper —— Connected Experience for All.

Samsung 6G White Paper

https://cdn.codeground.org/nsr/downloads/researchareas/6G%20Vision.pdf

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6G

Spectrum Expanding the Frontier

Samsung 6G Spectrum White Paper

https://cdn.codeground.org/nsr/downloads/researchareas/2022May_6G_Spectrum.pdf

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