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Research and Development for 6G Wireless

6G simulator and future network technologies

NTT DOCOMO,INC.

5G Development and 6G Roadmap

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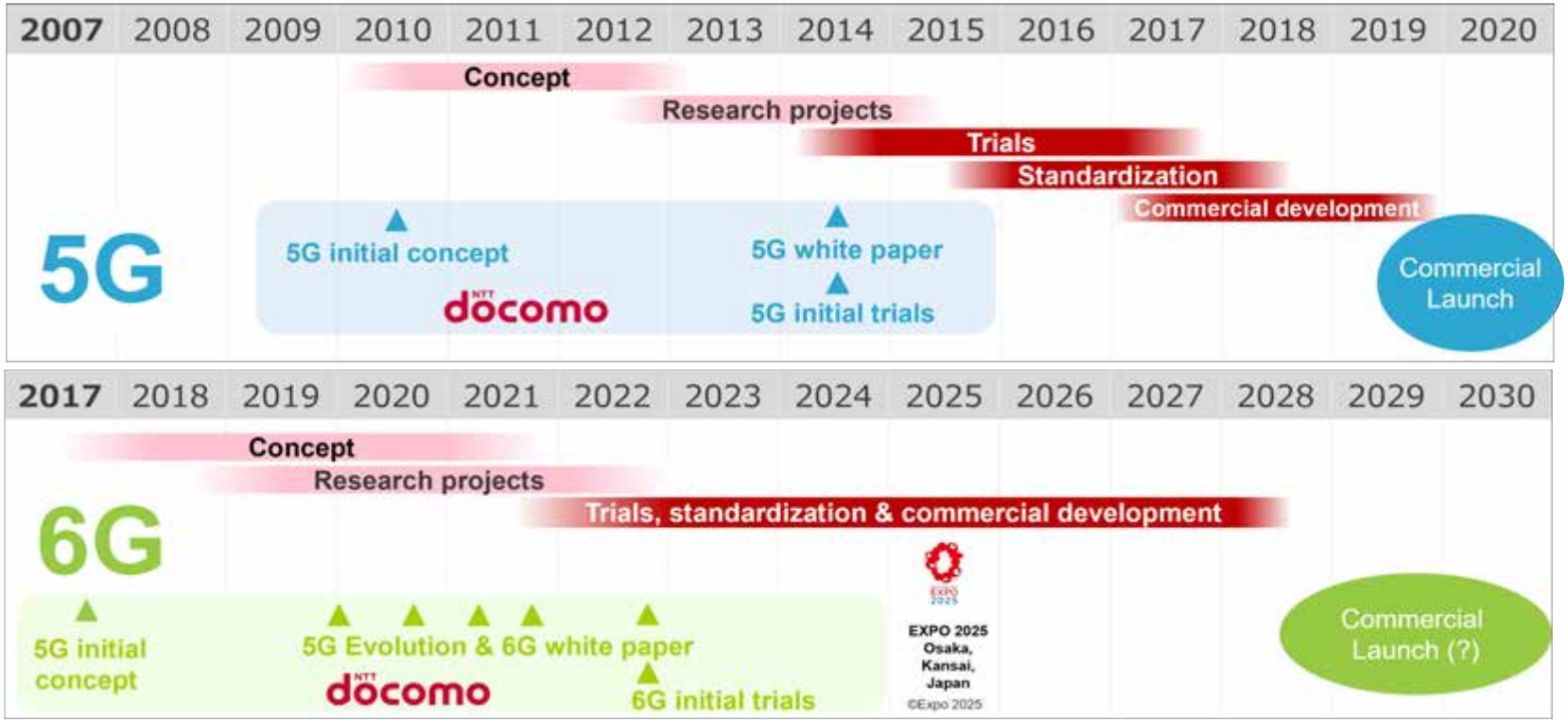

5G Evolution & 6G

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Technology Development and Key Topics

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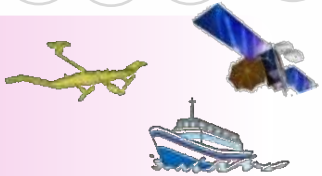
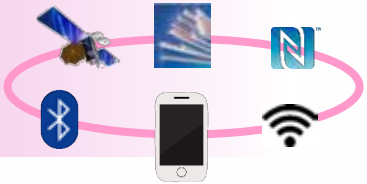
Distributed network advancement in spatial domain

Coverage extension, including non-terrestrial network (NTN)

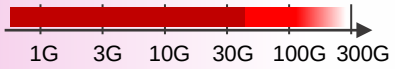


Extended ultra-reliable and low latency communications

Integration of multiple wireless communication technologies

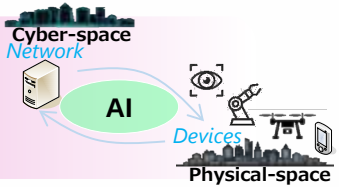


Enhancement of frequency utilization

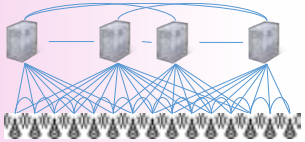


Further advancement of wireless transmission technologies (e.g. Massive MIMO)

Multifunctional wireless communication systems and AI technologies



Advancing network architecture



Pioneering 6G Frequency Bands

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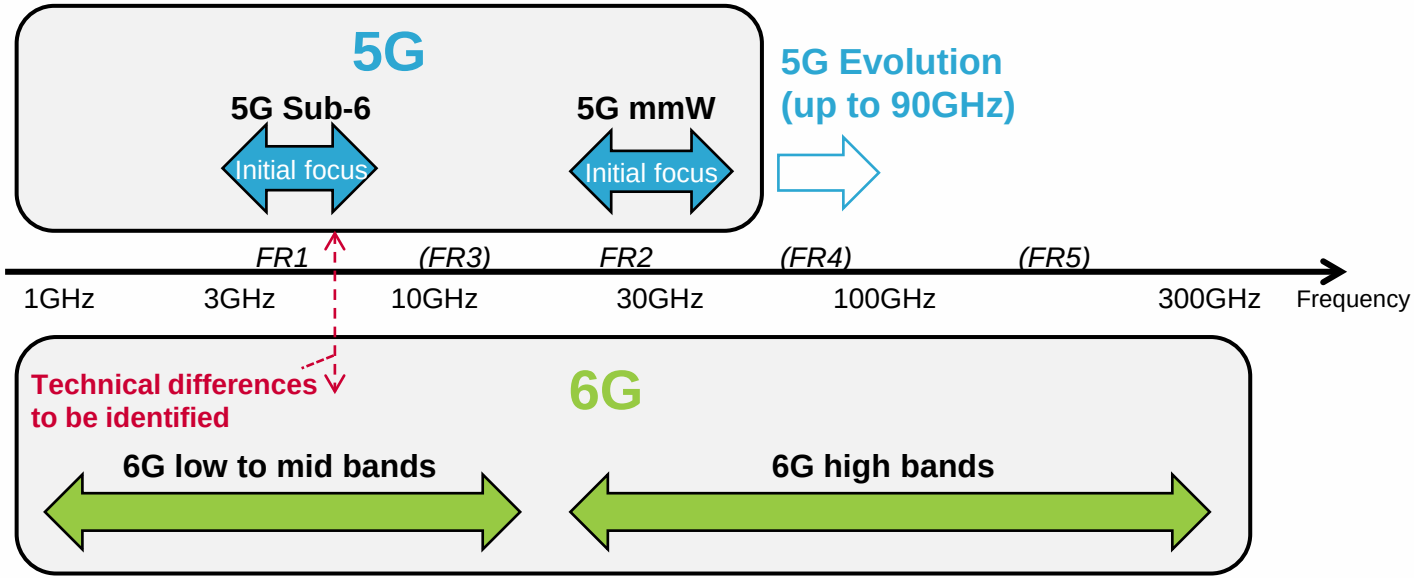
- Sub-THz bands (~ 300 GHz) above those for 5G
- Mid-bands including existing 5G bands



6G Simulated Performance Visualization

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6G system-level simulator

6G concept &
elemental technologies

6G Simulated Performance Visualization

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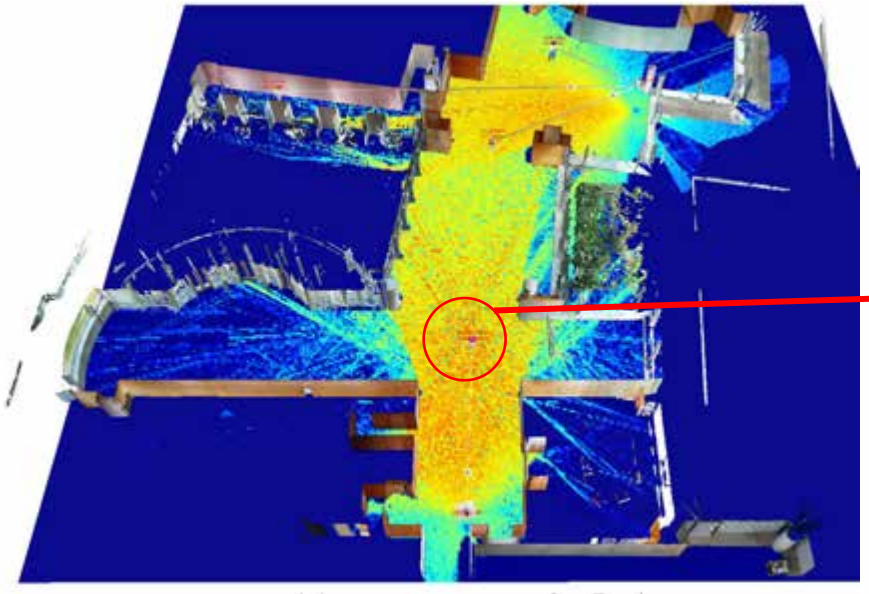
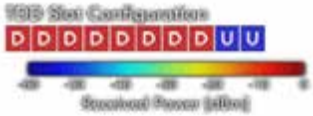
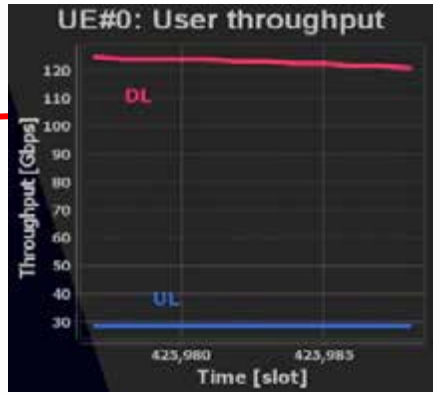
- Highly accurate throughput evaluation in specific indoor/factory environments





Achieved



6G Trials with Major Partners

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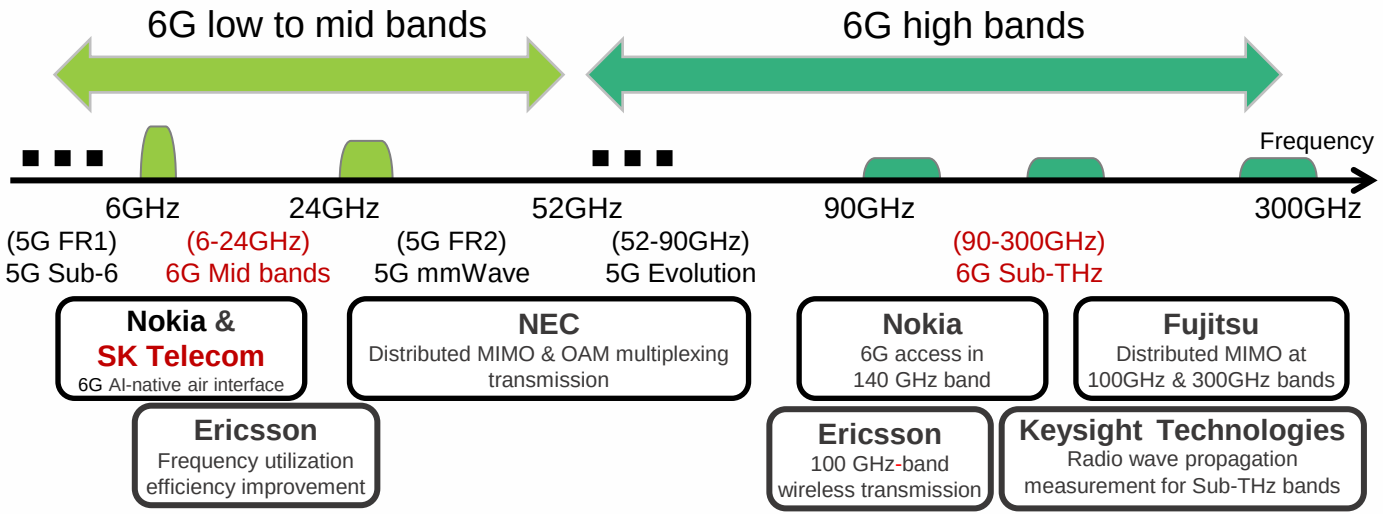
From June 2022



Starting February 22, 2024

Rohde & Schwarz
Wireless-sensing propagation measurement and performance evaluation

NEW PARTNERS

AI-native Air Interface PoC for 6G with NOKIA, SKT and NTT

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- Higher performance system with a learned air interface by utilizing AI/ML technologies
- Because of the pilot-less scheme, robust to the channel variation achieved with improved throughput gain

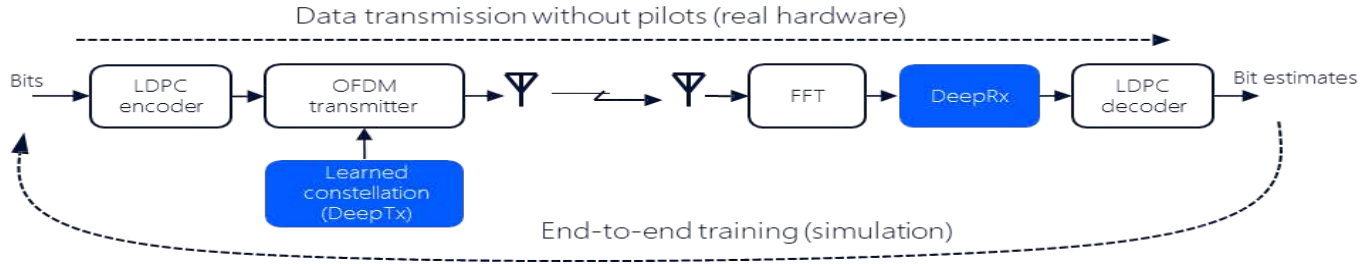
Scope and Objectives

Scope

- Higher throughput with an AI-based air interface

Objectives

- Achievement of throughput gains
- Validation in various environments and scenarios



New Collaboration with Rohde & Schwarz and NTT

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- Leveraging Rohde & Schwarz's measurement system construction technology, advance the study of channel models for new wireless sensing evaluations
- We plan to evaluate the performance of wireless sensing through measurements

Objectives and Roles

Conducting experiments to evaluate the radio wave propagation characteristics and wireless sensing performance

Rohde & Schwarz	Measurement systems construction
NTT	Radio wave propagation measurement and sensing performance evaluation
DOCOMO	Investigation on trial environment and use case for wireless sensing

Sub-THz High-rate Transmission with NOKIA and NTT

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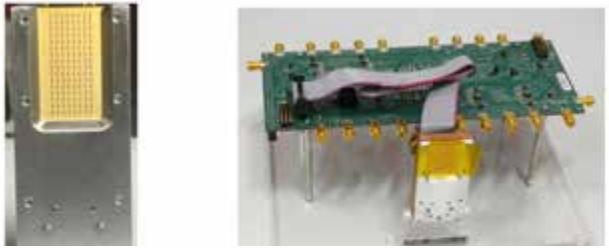
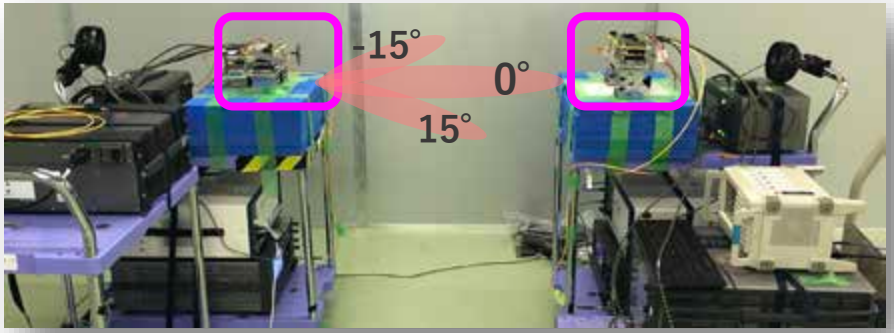
- Confirmed that beam tracking using the phased array functions properly, ensuring good reception quality even when the receiver is in motion

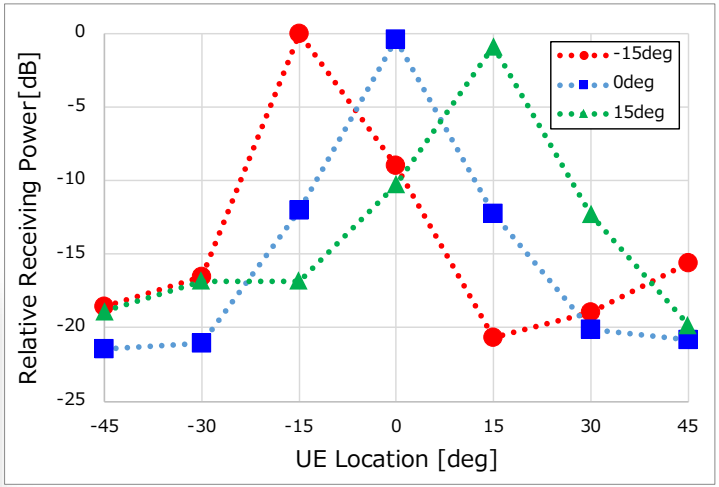
128-element Phased-array Antenna



Experiment Scene



Experimental Results



PoC with Keysight and NTT

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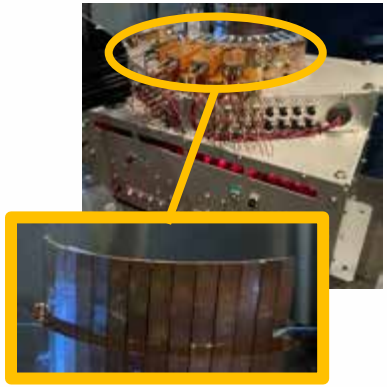
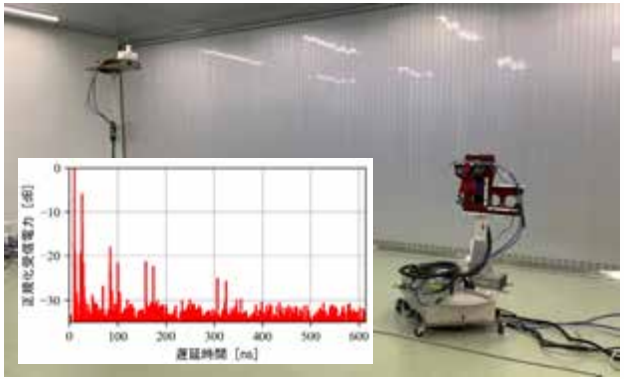
- Evaluating radio wave propagation characteristics with ultra-high resolution in the time domain by measuring the ultra-wideband SISO channel propagation
- Conducting propagation measurements with an 896-element Massive MIMO (multiple-input multiple-output) antenna for real-time measurements in dynamic environments

Massive MIMO Channel Sounder Measurements and Evaluation



896-element super multi-element antenna

Outdoor Test

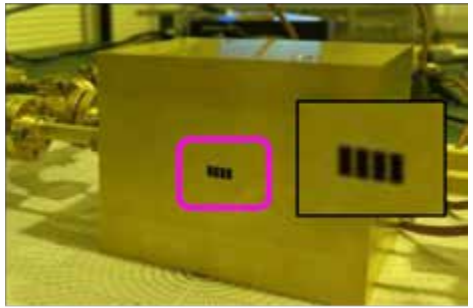


Indoor Test

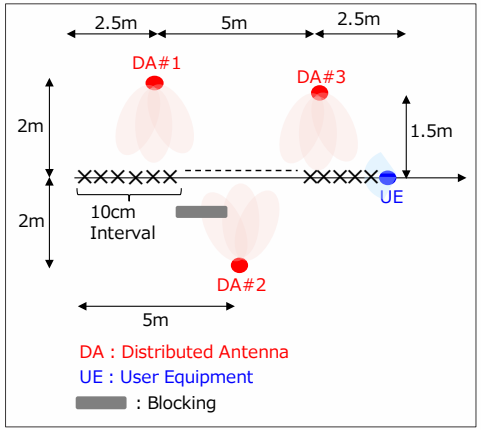
PoC with Fujitsu and NTT

- Conducted indoor experiments in Japan utilizing a 100 GHz band wireless circuit equipped with a four-element array antenna developed by Fujitsu
- It involved transmitting radio waves and measuring the received power at various positional relationships between the distributed antenna and the terminal

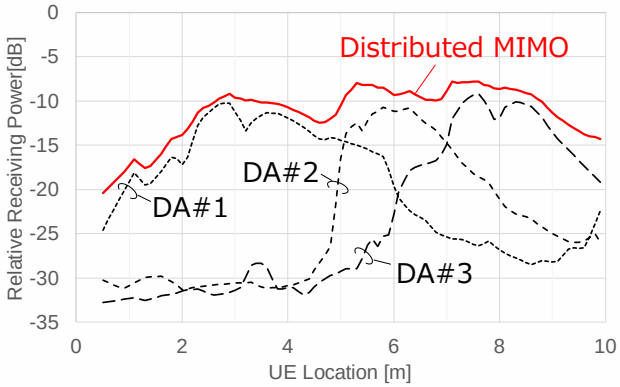
100GHz band 4-element array antenna



Experimental Scene



Experimental Results

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