

# 6G & Anritsu Initiatives

Hanako Noda

CTO

ANRITSU CORPORATION

June 22<sup>nd</sup> , 2023



All information contained in this release which pertains to the current plans, estimates, strategies and beliefs of ANRITSU CORPORATION (hereafter "Anritsu") that is not historical fact shall be considered forward-looking statements of future business results or other forward-looking projections pertinent to the business of Anritsu. Implicit in reliance on these and all future projections is the unavoidable risk, caused by the existence of uncertainties about future events, that any and all suggested projections may not, come to pass. Forward-looking statements include but are not limited to those using words such as "believe", "expect", "plans", "strategy", "prospects", "forecast", "estimate", "project", "anticipate", "may" or "might" and words of similar meaning in connection with a discussion of future operations or financial performance.

Actual business results are the outcome of a number of unknown variables and may substantially differ from the figures projected herein. Factors which may affect the actual business results include but are not limited to the economic situation in the geographic areas in which Anritsu conducts business, including but not limited to, Japan, Americas, Asia, and Europe, changes in actual demand for Anritsu products and services, increases or decreases in the competitive nature of markets in which Anritsu sells products or buys supplies, changing aptitudes at providing services, and exchange rates.

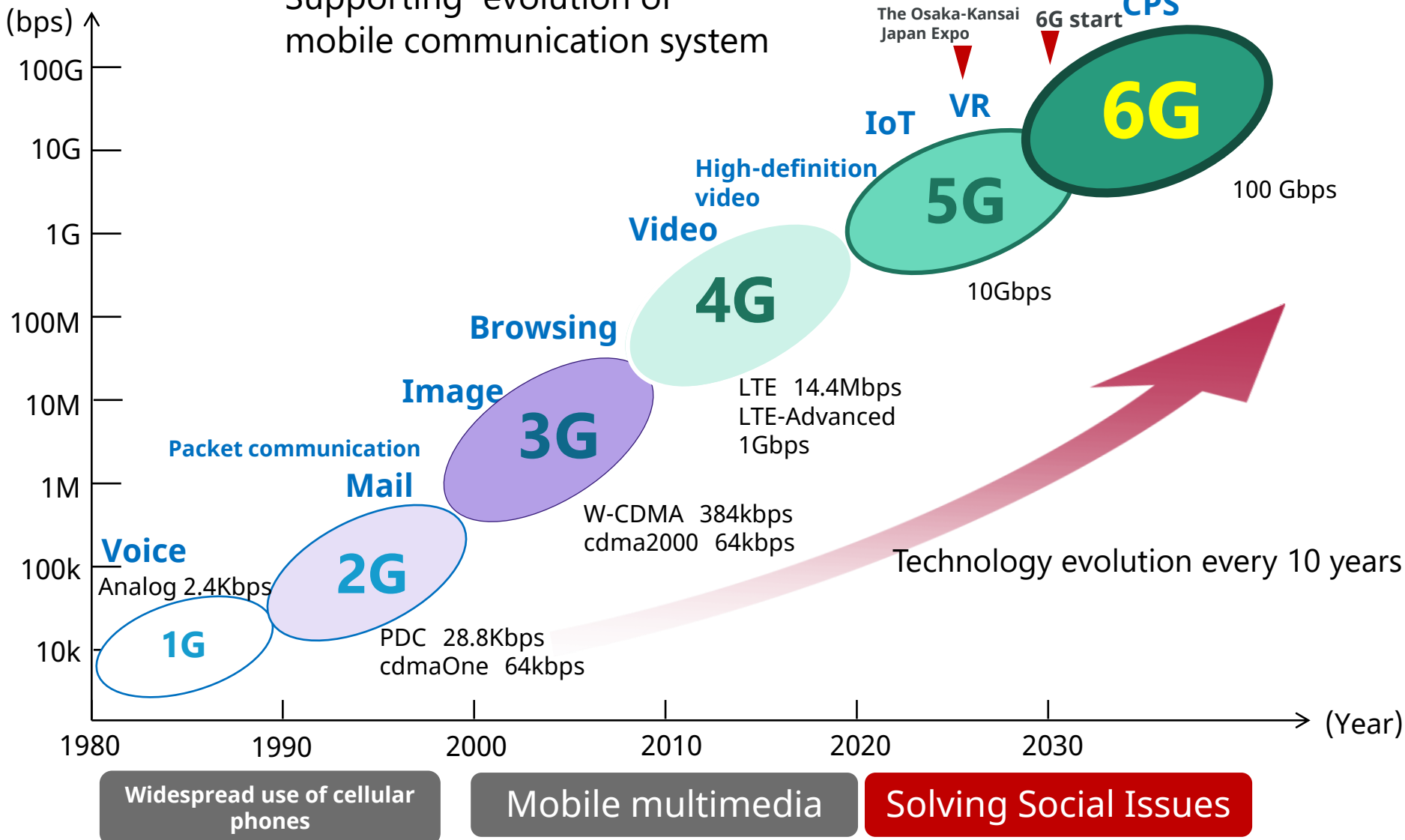
You also should not place reliance on any obligation of Anritsu to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise. Anritsu disclaims any such obligation.

# Contents

1. What is 6G
2. Evolution from 5G to 6G
3. Beyond5G/6G initiatives in each country
4. Standardization Schedule in 3GPP
5. Anritsu Initiative for 6G

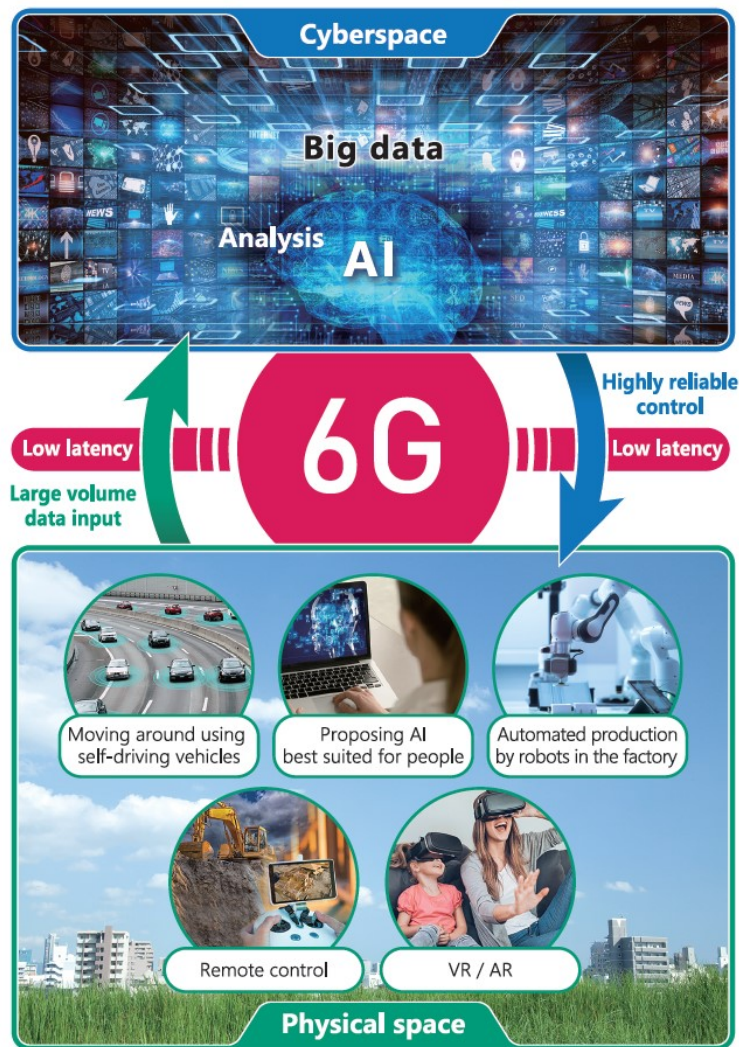
# 1-1. What is 6G ~Evolution of mobile communication~

Max Communication speed



(From materials of the Ministry of Internal Affairs and Communications)

# 1-2. What is 6G ~World to be realized with 6G~



**CPS**(Cyber Physical System)

or

**Digital Twin**

+ IOWN

Real space sensing data is drawn into cyber space, and real space is reproduced in cyber space to predict the future.

# 1-3. What is 6G ~Evolution of CPS (Cyber Physical System)~

**Areas where 4G support  
is possible**

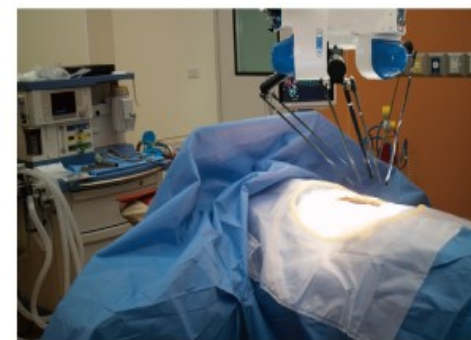
**Areas where 5G is expected  
to be used**

**6G**

**Visualization of the  
current situation**

**Virtual realization with  
sensor information +  
calculation or AI**

**Future prediction by  
mixing multiple  
sources of  
information**



**Online  
consultation**

**Online  
inspection**

**Online diagnosis  
/ health checkup**

**Remote diagnosis /  
health checkup  
support**

**Remote  
treatment /  
therapeutic  
assistance**

**Telesurgery  
support**

**Remote robotic  
surgery support /  
guidance**

**Remote  
robotic surgery**

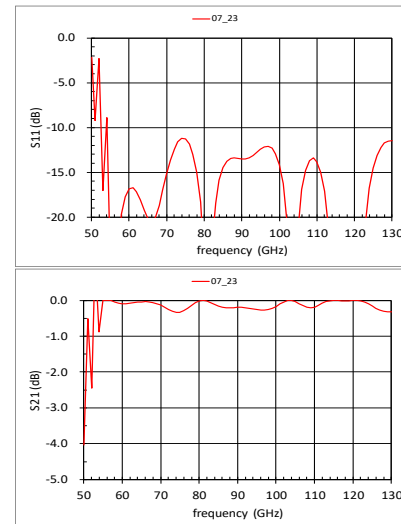
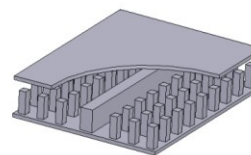
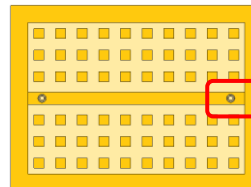
**Advanced medical level**

# 1-4. What is 6G ~CPS Example Physical Simulation ~

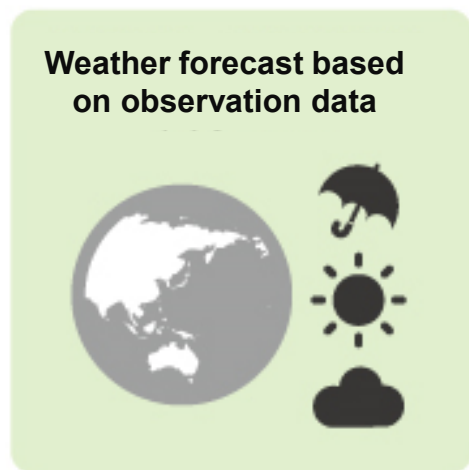
## ■ Furniture placement simulation



## ■ Design by electromagnetic field analysis



## ■ Power demand forecast



Power demand forecast for several months ahead



Power demand record





## 2-1. Evolution from 5G to 6G

# 5G

# 6G

3G

4G

5G

6G

2000

2010

2020

2030



Information  
at hand



Various  
applications  
and videos



Advancing fixed and  
mobile  
communications



Real-time remote  
control of robots



Introduction of wireless  
communication to critical  
services (telemedicine,  
autonomous driving, etc.)



Hologram  
telepresence



Expansion of  
communication  
environment



Connections to new  
application areas



XR (AR, VR, etc.)



Digital twins



Sensor fusion



Human augmentation

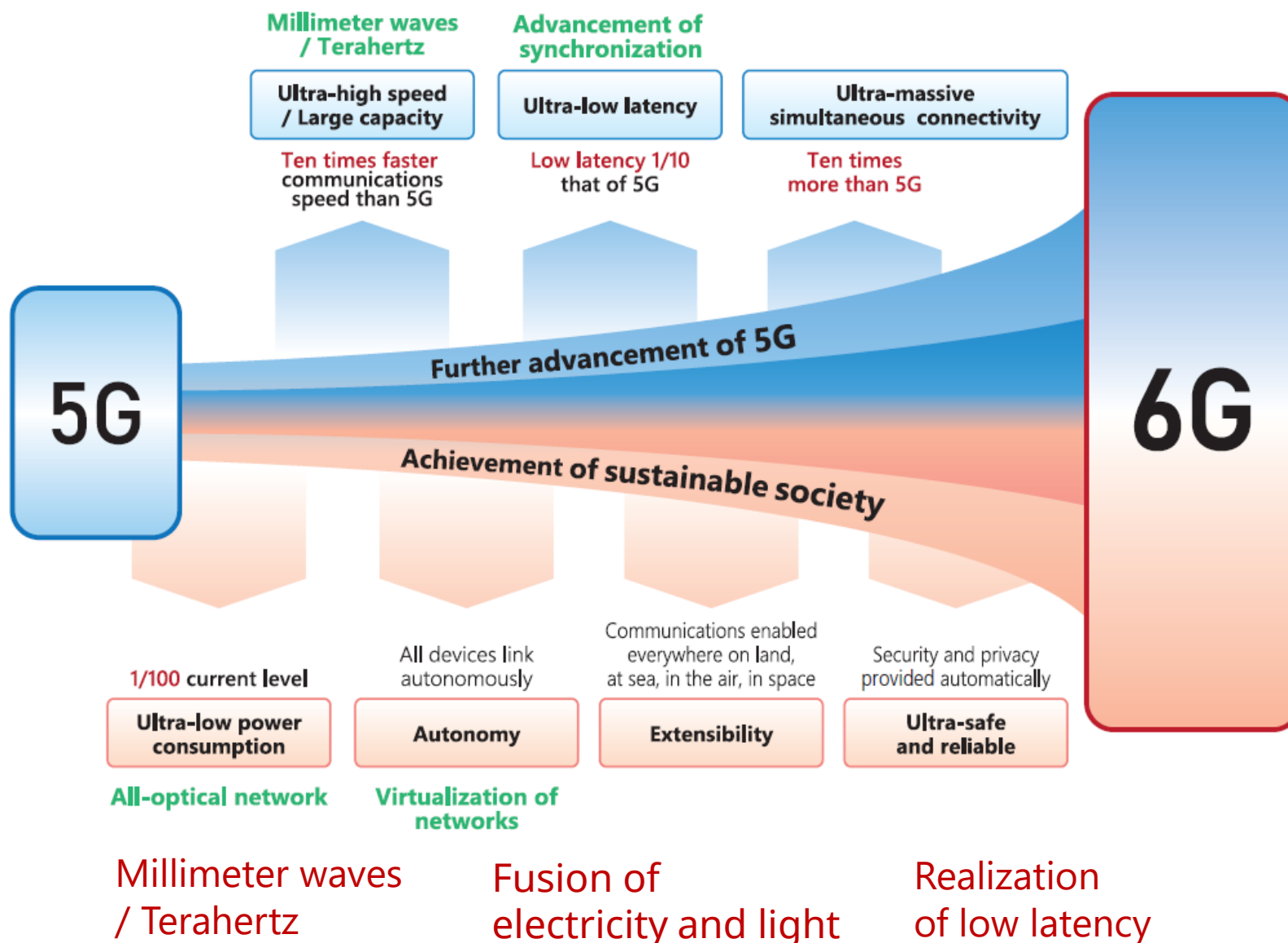
Mobile multimedia

Social infrastructure

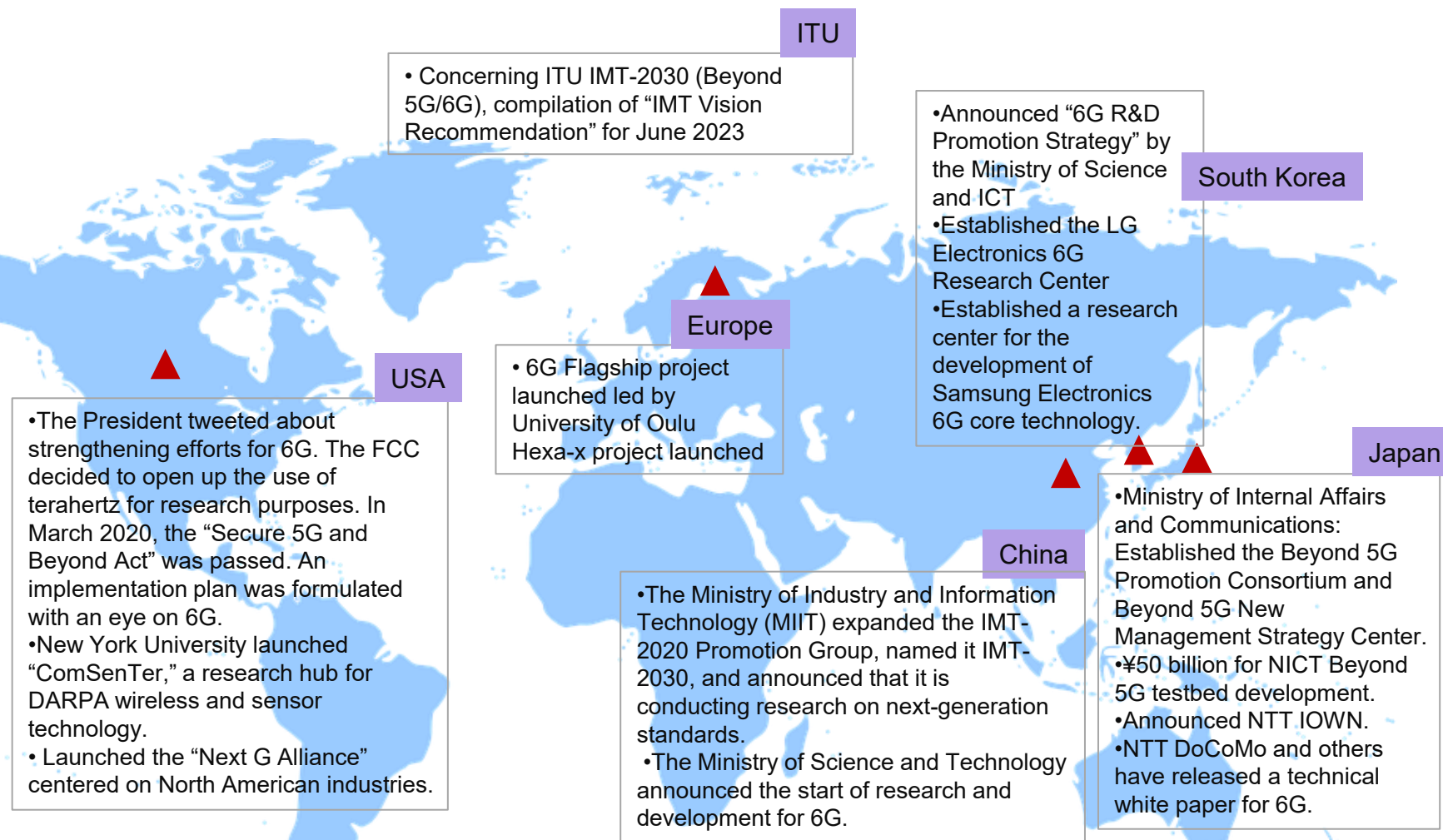
6G will advance society through further technological innovation of 5G, which has become part of social infrastructure



## 2-2. Evolution from 5G to 6G ~Elemental Technologies Supporting Evolution~



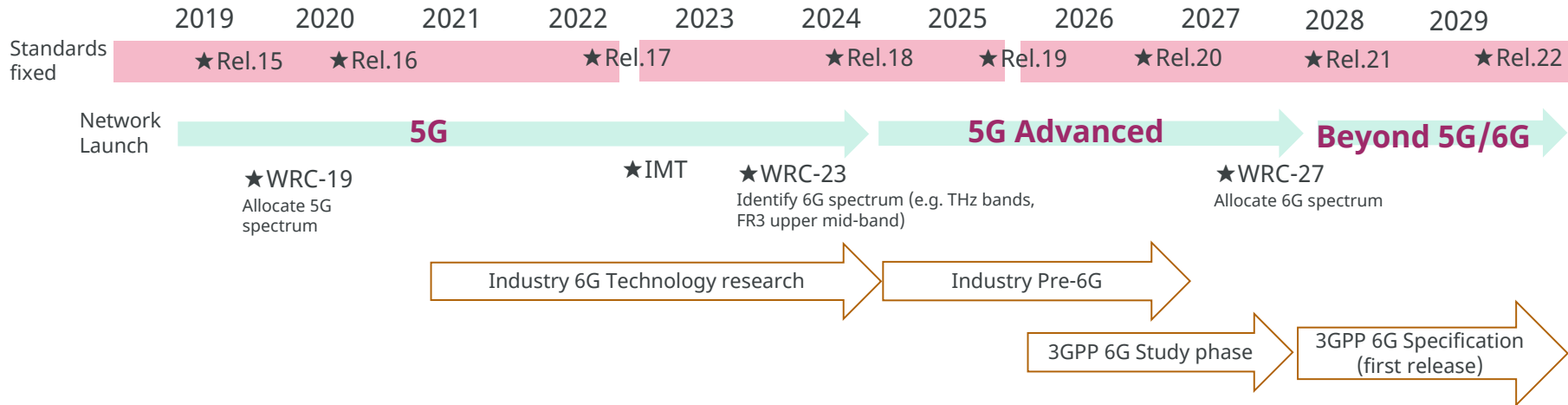
### 3. Beyond5G/6G Initiatives in Each Country



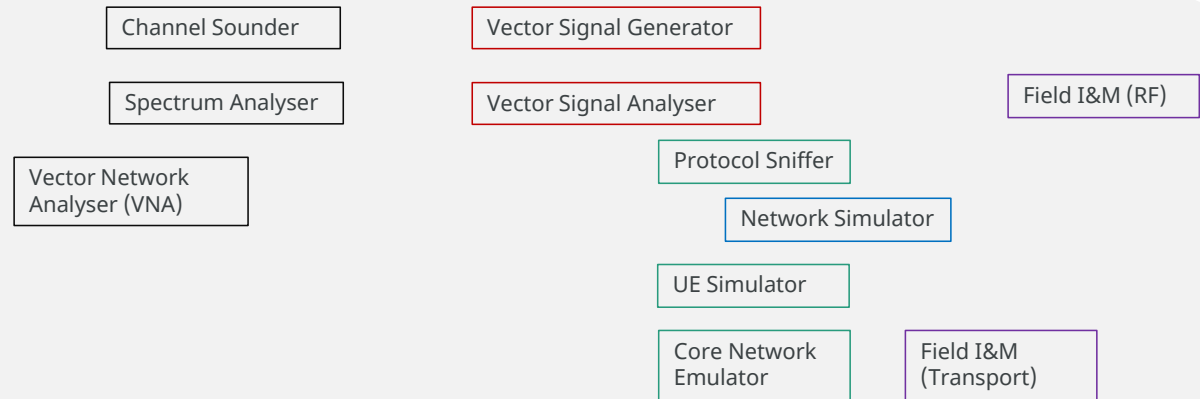
From around 2018, efforts toward Beyond 5G/6G have started across the world

Source: Created by Anritsu based on publicly available information (as of June 2023)

# 4. Schedule for 6G

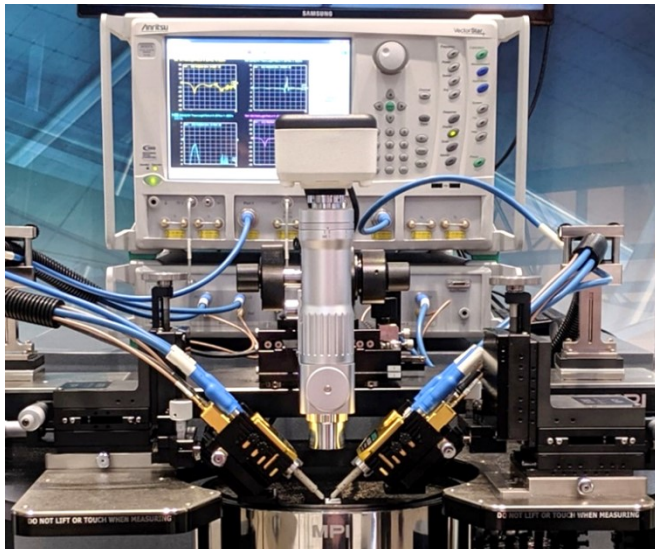


## Industry Test Requirements.



Study of 6G started from 3GPP Rel.20, standardization is Rel.21. The frequency will start to be discussed at WRC-23 and will be allocated at WRC-27.

### **ME7838 series** Vector Network Analyzer



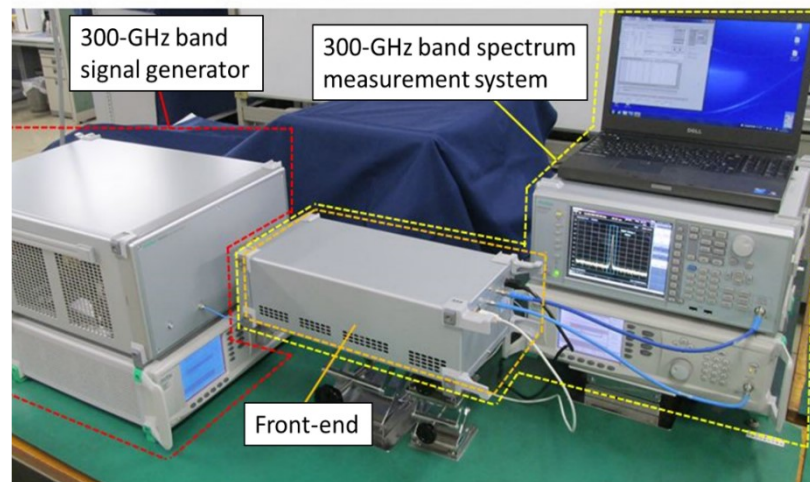
The only VNA that can continuously measure up to DC-220 GHz

Advances in material measurement, circuit evaluation, and component evaluation for 6G

### **300 GHz band spectrum Measurement system**

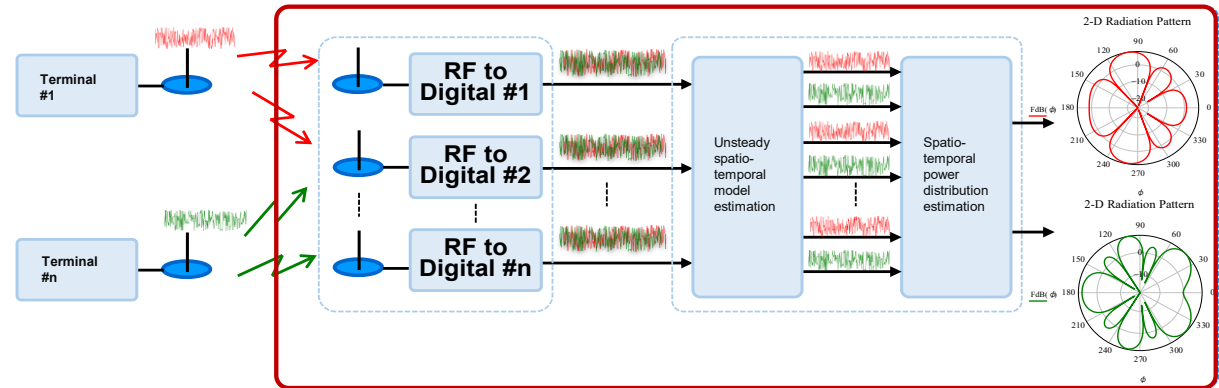
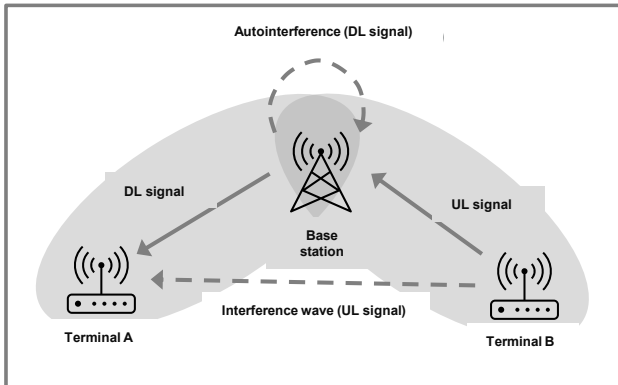
300-GHz band spectrum measurement system

External appearance of measurement system



Since 2011, we have developed a spectrum evaluation system above 100 GHz in the research and development for the expansion of radio wave resources by the Ministry of Internal Affairs and Communications. It is effective for confirming that there are no unwanted emissions in order to prevent interference with conventional communication systems.

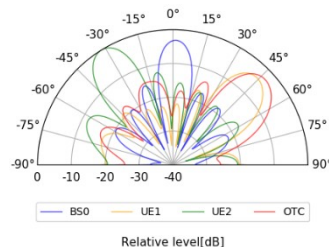
## 5-2. Anritsu's Initiatives for 6G ~Radio interference monitoring~



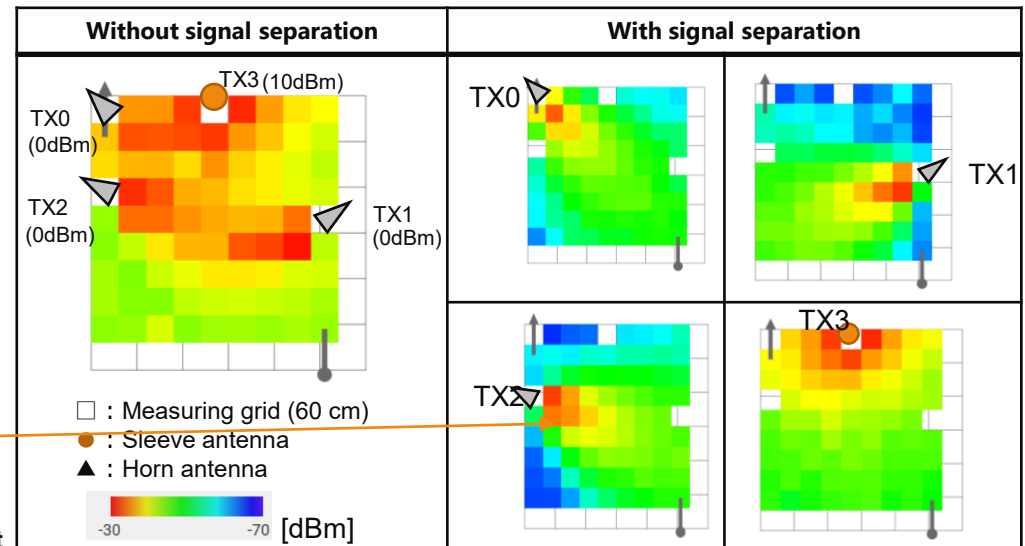
Full-Duplex works for improving frequency effective efficiency

Technology to determine whether Full-Duplex is possible (=presence or absence of interference): radio wave interference monitoring

Successful separation of signals with the same frequency

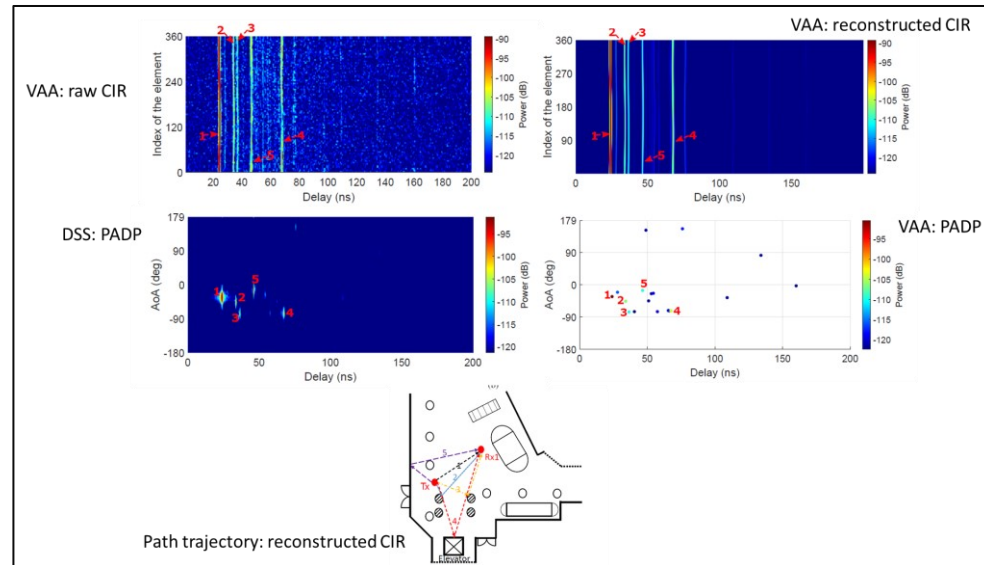
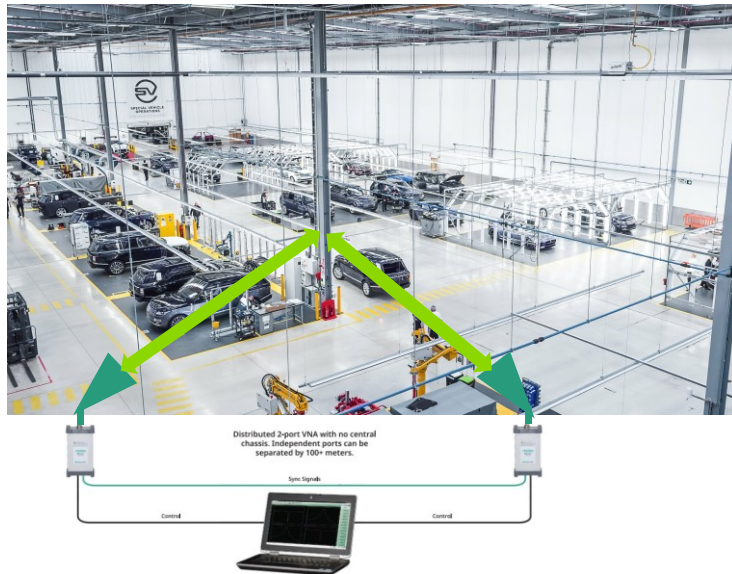


Angular spectrum waveform example of central part





## 5-3. Anritsu's Initiatives for 6G ~Beyond 5G/6G Channel Sounding~



This is a system for observing the propagation status of radio waves in a factory. It is connected by optical fiber, so it is possible to observe the propagation status while moving over a distance of 100 m or more. Compatible with FR1, FR2, FR3.

Anritsu Advancing beyond

Anritsu starts joint research on 6G with Aalborg University

2023/04/13



Anritsu Corporation (President: Hirokazu Hamada) is pleased to announce that it will start research on 6G jointly with Aalborg University in Denmark.

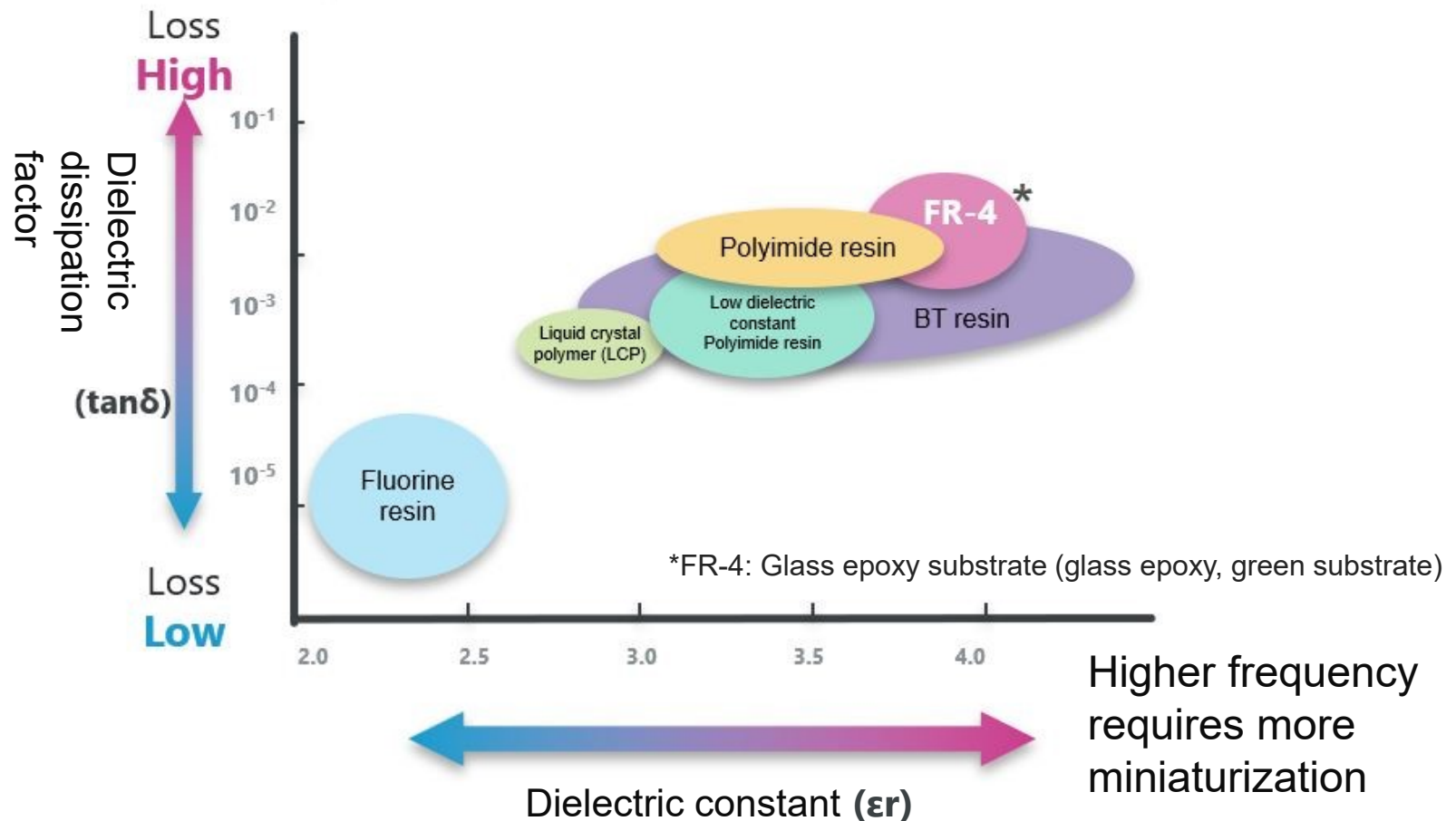
With this research, we will develop new technologies for channel sounding [\*1] and wireless channel sensing in the frequency bands being considered for 6G, including millimeter waves and terahertz waves. To establish this technology, we have combined the latest measurement functions using Anritsu's vector network analyzer with Aalborg University's antenna measurement system technology.

[\*1] Channel sounding : The evaluation of the propagation path characteristics of radio waves between a transmitter and receiver in wireless communications.



## 5-4. Anritsu's Initiatives for 6G ~Material Measurement by VNA~

We evaluate the material properties of objects in the path of radio waves and electrical signals. For example, we do evaluation of signal transmission and reflection characteristics on trees, windows, walls, cables, and circuits on the communication path.



## 5-5. Anritsu's Initiatives for 6G



In the field of communications measurement, Anritsu has contributed to early commercialization by providing test solutions that closely match the customer's development process. We will continue to contribute to the development of society by accumulating technology and working closely with our customers toward the spread and evolution of 5G and Beyond 5G/6G.

