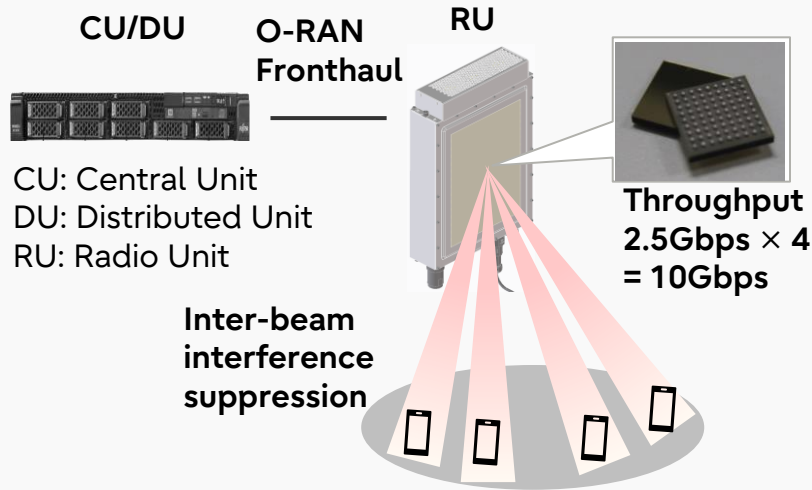


# Green technologies toward 6G

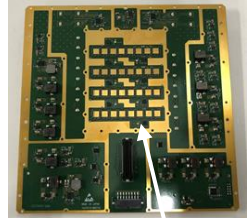
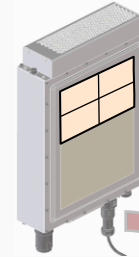
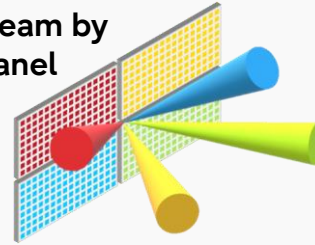
# Multi-beam multiplexing technology

- The world first mmWave beam-forming IC (BFIC) supporting multi-beam multiplexing (4 beams / 8 streams) is under development
- 10Gbps downlink throughput can be realized with small RU size



## Conventional multi-beam by multi-panel

4-beam by  
4 panel

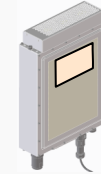
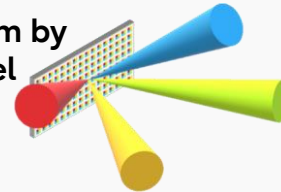


Conventional  
BFIC

Size <1/2

## Proposed multi-beam by single-panel

4-beam by  
1 panel



Proposed multi-beam  
BFIC

This material is based on results obtained from the project, "Research and Development Project of the Enhanced infrastructures for Post-5G Information and Communication Systems" (JPNP20017), by the New Energy and Industrial Technology Development Organization (NEDO).  
<https://www.fujitsu.com/global/about/resources/news/press-releases/2023/0828-02.html>

# Photonics-electronics convergence technology

NTT group and Fujitsu starts development of “Integrated RU module” characterized by low power consumption for deployment acceleration of next generation mobile networks.

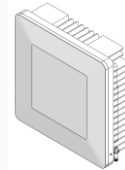
- Low power consumption and size by integrating RU function to Wireless digital ASIC
- 100Gbps Bi-directional optical engine with Photonics-Electronics convergence technology

Existing 5G mmW RU

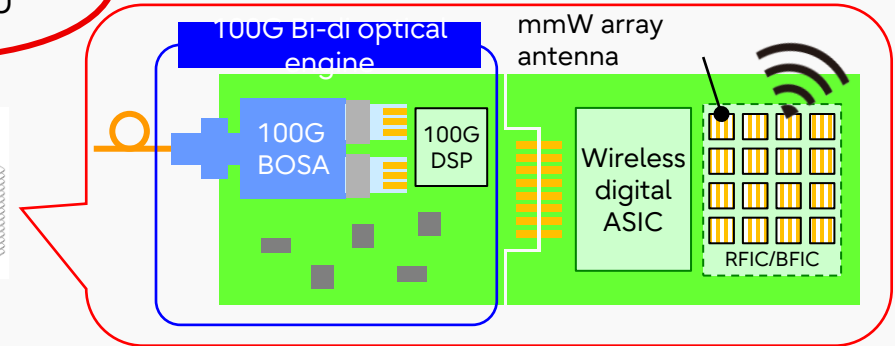


High capacity  
Low power consumption  
Compact size

Next Generation 6G mmW RU



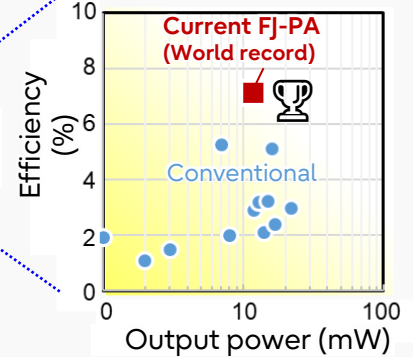
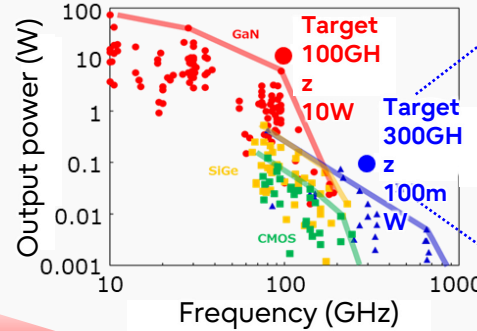
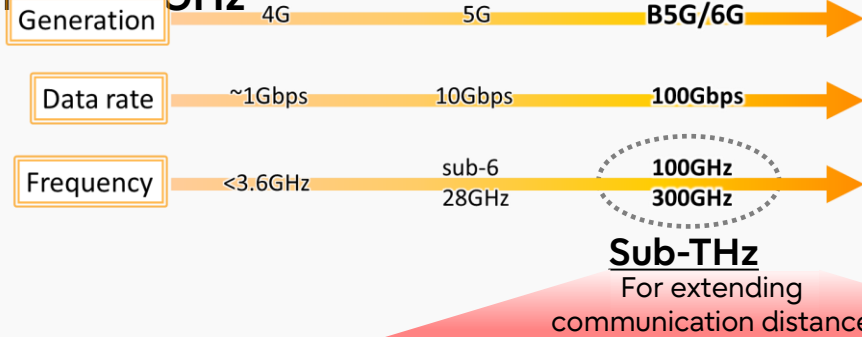
Integrated RU Module



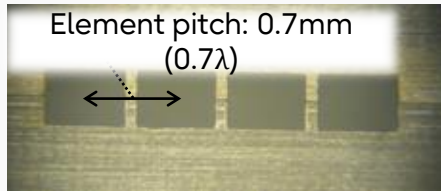
These research results were obtained from the grant program (JPJ012368G50401) by National Institute of Information and Communications Technology (NICT), Japan.

# Sub-terahertz technology

To establish leading position in the market by developing the sub-THz array antennas and the world No1 high-power and high-efficient power amplifiers for 100/300GHz

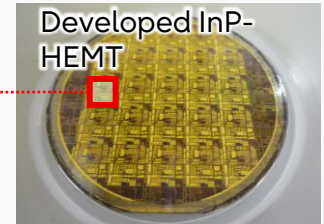
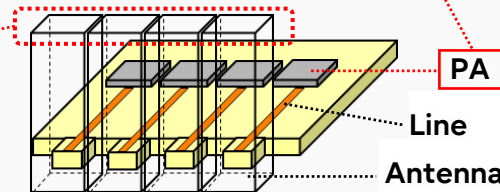


## ① Array antennas for beam forming



Developed array antennas (1×4 array)

## ② High-power amplifiers (PAs)



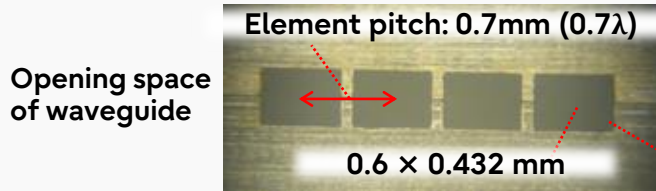
6G joint trials press release  
<https://www.fujitsu.com/global/about/resources/news/press-releases/2022/0606-01.html>

This work was partially supported by "The research and development project for the expansion of radio spectrum resources (JPJ000254)" of the Ministry of Internal Affairs and Communication, and the commissioned research "R&D on THz band ultra high-capacity wireless communications for beyond 5G" (JPJ012368C00301) by National Institute of Information and Communications Technology (NICT), Japan.

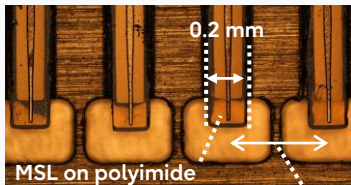
Promote research and development for practical application of our power amplifier.

## ① sub-THz antenna array module

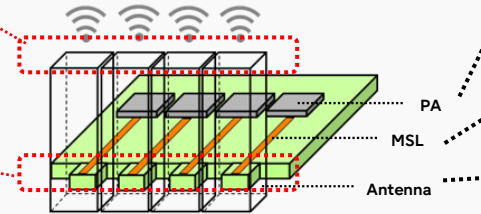
To reduce the grating lobe at 300GHz, a waveguide-based antenna array was successfully developed with an element pitch of only 0.7 mm



MSL-  
Waveguide  
transition



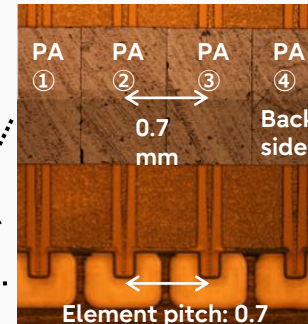
0.7 mm ( $0.7\lambda$ )



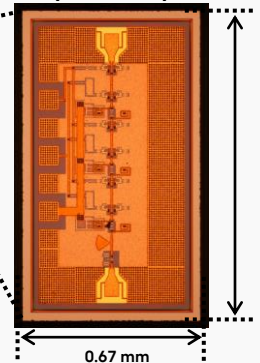
## ② InP-based PA for reducing element pitch

High-power and high-efficiency InP-based PA was designed for element pitch of 0.7 mm which show reducing grating lobes

Inside of module



InP-based PA  
(Front side)



These works were partially supported by the commissioned research "R&D on THz band ultra high-capacity wireless communications for beyond 5G" (JPJ012368C00301) by National Institute of Information and Communications Technology (NICT), Japan.

**Thank you**

