Direct connection of THz wireless I/O with optical signal processors using microcombs

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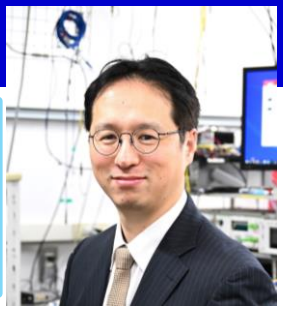


Grand Challenge and Goal：

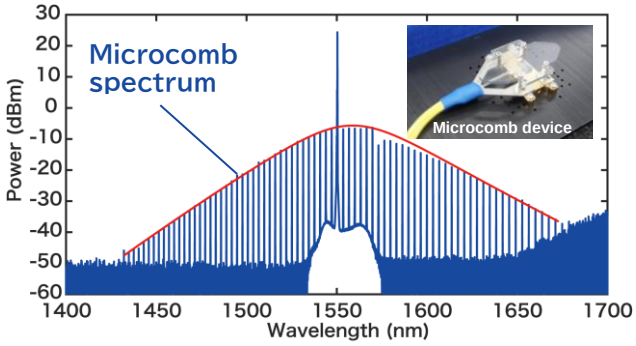
Optical interconnects provide high bandwidth but are costly, while wireless communication can reduce operational costs but has limited bandwidth. Our goal is to directly connect the THz wireless module to optical processors, aiming to enhance system speed and efficiency.

Summary：

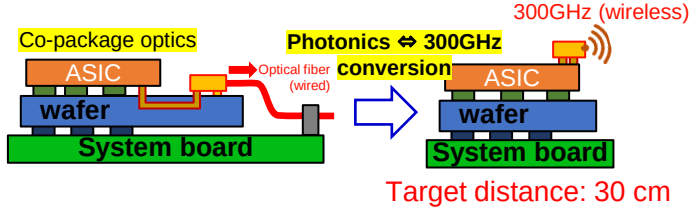
- **Develop a photonic AI accelerator with a low-latency I/O interface by directly converting optical signals into THz band (100–600 GHz) wireless signals.**
- **Microcombs are ideal for implementing wavelength-division multiplexing, essential for optical accelerators to achieve parallel processing.**
- **Microcombs are also well-suited for generating ultra-low noise THz waves.**
- **Since microcombs are crucial for advancing both optical accelerators and THz wave generation, we will integrate these two technologies to develop a direct optical-to-wireless signal conversion, enhancing the performance of photonic integrated circuits with high-speed I/O.**

Social Impact：

- **Researching optical signal processing with fast I/O will accelerate the entire system.**
- **Our research aims to reduce HPC operational costs through wireless interconnects within boards and racks, potentially paving the way for wireless data centers.**



A microcomb generated by a SiN microring with a free-spectral range of 300 GHz. We can generate low-noise THz waves by converting the optical beat signal to an electrical signal using a UTC-PD.



An example of the proposed system involves replacing optical interconnects with ultrafast wireless transmission for the output of photonic integrated circuits, enabling fast and flexible connections with other devices.