



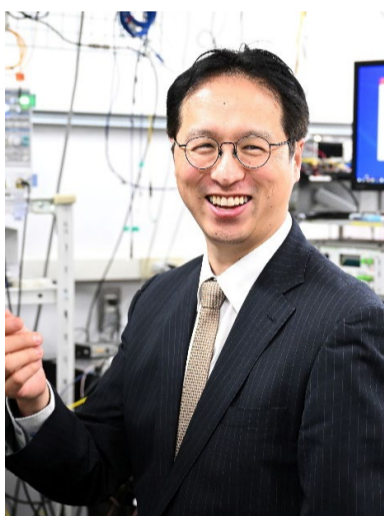
# 98<sup>th</sup> RAP Seminar

The 98<sup>th</sup> Seminar on RIKEN Center for Advanced Photonics

Language: Japanese / 日本語

## Microcomb Technologies for Optical Signal Processing

光信号処理応用に向けたマイクロコム



**Prof. Takasumi Tanabe**  
(講師) 田邊孝純 教授

Faculty of Science and Technology,  
Keio University

慶應義塾大学 理工学部

**February 20 (Fri)**

**16:20-17:20, 2026**

Room W524-W525, 5F, Cooperation center,  
Wako campus, RIKEN

理研 和光地区 研究交流棟 5F 会議室 W524-W525

Microresonator-based optical frequency combs (microcombs) have emerged as a powerful platform for optical signal processing owing to their compactness and mutual coherence across many wavelength channels. In this talk, I first introduce the fundamentals of microcombs, including their generation mechanisms in high-Q microresonators and the key physical requirements for stable soliton formation. The advantages of microcombs as multi-wavelength coherent light sources are then discussed, with emphasis on their suitability for integrated photonic systems.

Next, I present applications, focusing on massively parallel optical communications and photonic-assisted terahertz signal generation in the 300 GHz band. Experimental demonstrations show that microcombs enable low-latency, low-phase-noise signal generation and transmission, highlighting clear benefits over conventional electronic approaches.

Building on these foundations, the latter part of the talk addresses the application of microcombs to optical signal processing, particularly optical convolution. By exploiting wavelength- and time-division multiplexing provided by microcombs, we demonstrate parallel optical convolution operations and their direct transmission over a 300 GHz wireless link. These results illustrate a compute-and-transmit paradigm in which optical-domain computation and wireless transmission are tightly integrated.



**Pre-registration**