Docket #: S22-046

Frequency Comb-Based Analog Coherent Receiver for Multi-Wavelength Optical Links

Researchers at Stanford have developed a comb-based analog coherent receiver for wavelength-division multiplexed (WDM) optical data center links. Their solution addresses the need for a low-power optical coherent receiver to accommodate next-generation multi-wavelength data center links. The design offers an increase in per channel data rates to meet growing data center traffic demands. As data center systems are power- and cost-constrained, the receiver in question only uses analog components to reduce power consumption. Existing technologies for data center links are based on intensity modulation and direct detection. Using coherent detection, the proposed solution allows systems to scale to higher data rates per wavelength. Previous approaches have implemented independent analog coherent receivers for different wavelengths in a multi-wavelength system. The Stanford technology utilizes the comb so that receiver operations can be carried out jointly across channels to lower power consumption and cost.

Stage of Development
Proof of concept. Enables coherent detection of QPSK and 16-QAM signals in multiple wavelength channels.

Applications

- Data center communication and networking equipment
- Development of low-cost and low-power transceiver technologies for data centers as they scale to higher capacity

Advantages

- Allows systems to scale to higher data rates per wavelength
- Supports lower power consumption and cost

Publications

- E. Chen, B. Buscaino and J. M. Kahn, "Phase Noise Analysis of Resonator-Enhanced Electro-Optic Comb-Based Analog Coherent Receivers," in *Journal of Lightwave Technology,* 2022, doi: 10.1109/JLT.2022.3200632.

Patents

- Published Application: WO2023154569
- Published Application: 20250158720
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