Compressive High-Speed Optical Transceiver

Tech ID: 32540 / UC Case 2021-684-0

ABSTRACT

Researchers at the University of California, Davis have developed an optical transceiver that uses compressive sensing to reduce bandwidth requirements and improve signal resolution.

FULL DESCRIPTION

In communication systems, transceivers are used to send and receive information, commonly through optical fibers for high-frequency signals. Optical transceivers typically have bandwidth requirements that are proportional to Nyquist sampling rates of the data being captured, meaning that in high frequency applications the bandwidth requirements are substantial. This tradeoff creates an information bottleneck, limiting the performance and speed of other components in the system. An optical transceiver with the ability to compress data in some manner would greatly simplify applications in high-frequency signal processing and communication systems.

Researchers at the University of California Davis have developed a high-speed optical transceiver that uses compressive sensing to reduce bandwidth requirements by orders of magnitude. Signals processed by transceivers are typically sparse in the time-frequency domain; via compressive sensing, they can be accurately reconstructed using less samples than what is usually necessary. Compressive sensing allows the transceiver to operate at very high frequencies while using the same bandwidth as typical optical transceivers. Such a device can be implemented for analog-to-digital (ADC) signal conversion, and could significantly improve bandwidth and signal resolution by encoding more than 10 times the equivalent number of bits as existing transceivers. This is accomplished by spectral splicing of the signal on several devices operating in parallel, using a stable frequency comb as reference. This technology could offer significant improvements in the speed and performance of analog and digital signal processing.

APPLICATIONS

- High frequency signal processing
- High performance photonic analog-to-digital (ADC) conversion in THz frequency range.

FEATURES/BENEFITS

- Reduced bandwidth requirements and improved signal resolution
- Low noise

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,119,882	10/15/2024	2021-684
Patent Cooperation Treaty	Published Application	WO 2021/257603	12/23/2021	2021-684

CONTACT

Michael M. Mueller
mmmueller@ucdavis.edu
tel: .

INVENTORS

- Yoo, S.J. Ben

OTHER INFORMATION

KEYWORDS

optical transceiver, ADC, signal processing, high frequency

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Communications**
  - Optical
  - Wireless
- **Computer**
  - Hardware
- **Sensors & Instrumentation**
  - Other

RELATED CASES

2021-684-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Higher-Speed and More Energy-Efficient Signal Processing Platform for Neural Networks
- Crystal Orientation Optimized Optical Frequency Shifter
- Hyperspectral Compressive Imaging
- Multi-Wavelength, Nanophotonic, Neural Computing System
- Athermal Nanophotonic Lasers
- Ultra-High Resolution Multi-Platform Heterodyne Optical Imaging
- Multi-Wavelength, Laser Array
- Optical Interposers for Embedded Photonics Integration
- Ultrahigh-Bandwidth Low-Latency Reconfigurable Memory Interconnects by Wavelength Routing
- Development of a CMOS-Compatible, Nano-photonic, Laser
- Energy Efficient and Scalable Reconfigurable All-to-All Switching Architecture
- All-Optical Regenerators
- Tensorized Optical Neural Network Architecture
- Silicon Based Chirped Grating Emitter for Uniform Power Emission
- Energy-Efficient All-Optical Nanophotonic Computing
- 3D Photonic and Electronic Neuromorphic Artificial Intelligence
- Adapting Existing Computer Networks to a Quantum-Based Internet Future

University of California, Davis
Technology Transfer Office
1 Shields Avenue, Mrak Hall 4th Floor,
Davis,CA 95616

Tel:
530.754.8649
techtransfer@ucdavis.edu
https://research.ucdavis.edu/technology-transfer/
Fax:
530.754.7620