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Invited paper

A Bit-Rate-Transparent Monolithically Integrated Wavelength Converter

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Abstract

We demonstrate a monolithic wavelength converter based on a PD-EAM optical gate and tunable SGDBR laser operating at any bit rate up to 40 Gb/s in both NRZ and RZ formats.

Extended Abstract

Wavelength conversion in high-traffic WDM networks is becoming increasingly necessary for maximizing capacity and reducing signal contention. Although currently the predominant technology for wavelength conversion uses an optical-to-electronic-to-optical architecture, advancements in photonic integration have finally begun to offer solutions for wavelength conversion which lie entirely in the optical domain. Compared with traditional OEO systems, single-chip devices that can perform dynamic wavelength conversion are desirable for reducing power consumption, optical loss, and packaging complexity. In addition to conversion efficiency and output signal quality, the degree of transparency offered by these devices has become an important metric for performance because it facilitates the interoperability of many users across the network. This paper presents a monolithic wavelength converter that incorporates a widely tunable laser and optically pre-amplified receiver with a high-speed PD-EAM optical gate. This is the first demonstration of a single-chip device which performs bit-rate transparent wavelength conversion up to 40 Gb/s. Error free operation is achieved for both RZ and NRZ data formats, with less than 2.1 dB power penalty for all bit rates.

Matthew M. Dummer

Matthew M. Dummer received the Ph.D. degree in Electrical Engineering from the University of California, Santa Barbara in 2008. His research has focused on the development of high-functionality photonic integrated circuits for single-chip optical transceivers and wavelength converters. He specializes in the design and fabrication of high-power semiconductor optical amplifiers and photodiodes which are compatible with widely tunable lasers. He has also focused on traveling-wave circuit design for ultra-high-speed electroabsorption and Mach-Zehnder modulators.

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