Magneto-Optic Modulator

Tech ID: 32583 / UC Case 2020-701-0

BACKGROUND

Modulation, the key to any communication system, is the adjustment of the frequency, phase, or amplitude of a carrier wave to transfer information. In a typical optical communication system, the modulation is performed through the electro-optic effect where the phase or the amplitude of light is modulated using a radio frequency (RF) signal. Integrated electro-optics exist, but they are limited by the complex integration of the material on a silicon photonics platform (e.g., lithium niobate). Material degradation, low modulation bandwidth, and the large absorption in the materials also limit the maximum modulation frequency.

DESCRIPTION

Researchers at University of California, Santa Barbara have developed a novel integrated optical modulator based on the nonreciprocal phase shift in magneto-optic material. This invention can be efficiently integrated on any integrated optical waveguide including silicon waveguides (e.g., bonding). Unlike semiconductors at RF, magneto-optic materials do not suffer from plasma free carrier absorption, and perform reliably over time. Compared to standard magneto-optic modulators, this invention does not require polarization filters, removing a difficult fabrication step in integrated optics. This technology can be effectively used as a low-loss electro-optic transducer and for sensing. The integration, the broader modulation bandwidth, and the low RF propagation loss can be beneficial to achieve lower power consumption compared to standard electro-optic modulators.

ADVANTAGES

- Low-cost and large-scale efficient integration compared to other technologies
- Easy packaging due to the novel design of the electric driving circuit
- Minimal power and material consumption
- No polarization filters required

APPLICATIONS

- Sensors & Instrumentation
- Optics and Photonics
- Communications
  - -Optical
  - -Networking
- Semiconductors

PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	2023/004112	01/26/2023	2020-701

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OTHER INFORMATION

KEYWORDS

optic, modulator, modulation, network, waveguide, RF, bandwith, data, supercomputing, quantum, sensing

CATEGORIZED AS

- **Communications**
  - Internet
  - Networking
  - Optical
  - Other
  - Wireless
- **Optics and Photonics**
  - All Optics and Photonics
- **Semiconductors**
  - Other
  - Processing and Production
- **Sensors & Instrumentation**
  - Analytical
  - Other

Additional Patent Pending

▶ Scientific/Research

RELATED MATERIALS

▶ An integrated magneto-optic modulator for cryogenic applications - 08/05/2020

RELATED CASES

2020-701-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Bonding of Heterogeneous Material for Improved Yield and Performance of Photonic Integrated Circuits

▶ Epitaxial Laser Integration on Silicon Based Substrates

▶ A Hybrid Silicon Laser-Quantum Well Intermixing Wafer Bonded Integration Platform

▶ Integrated Reconfigurable Circulator

▶ Quantum Dot Photonic Integrated Circuits

▶ Ring Resonator-Based Optical Isolator and Circulator

▶ Integrated Dielectric Waveguide and Semiconductor Layer

▶ Orthogonal Mode Laser Gyro

▶ Loss Modulated Silicon Evanescent Lasers

▶ Monolithically Integrated Laser-Nonlinear Photonic Devices

▶ Misfit Dislocation Free Quantum Dot Lasers

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