Monolithically Integrated Laser-Nonlinear Photonic Devices

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OTHER INFORMATION

KEYWORDS

nonlinear, monolithically integrated, monolithic, laser, frequency comb, photonic

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics

RELATED CASES

2020-057-0

BACKGROUND

Typically, a laser fabricated on a chip is connected via fiber or chip-to-chip coupling to a non-linear photonic device (e.g. frequency comb generator) to generate the desired output frequencies in response to an input provided by the laser. This method increases the size, cost and power consumption of the non-linear photonic device. It would be beneficial to integrate lasers and non-linear photonic devices on a simple integrated circuit. Using semiconductor materials as a platform of the device overcomes some of the limitations of non-linear materials, but there are still waveguide losses that pose an obstacle.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed monolithically integrated non-linear photonic devices with a high quality factor, compact mode volume and ultra-efficient comb generation by leveraging a novel insulator platform. This ultra-low loss AlGaAs-on-insulator platform with anomalous dispersion and quality factors beyond 1.5 x 106 along with the high nonlinear coefficient and the small mode volume to enable a record low Kerr frequency comb generation threshold of approximately 36μW for a resonator with a 1 THz free spectral range (FSR). This result is approximately 100 times lower power consumption than previous instances of a semiconductor-on-insulator platform.

ADVANTAGES

- Unprecedented optical efficiency
- Lower fabrication cost
- Reduced device volume

APPLICATIONS

- Non-linear photonic devices
- Frequency comb generators
- LIDAR
- Spectroscopy
- Timekeeping
- Laser diodes

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20220121084	04/21/2022	2020-057

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
- Integrated Reconfigurable Circulator
- Magneto-Optic Modulator
- Quantum Dot Photonic Integrated Circuits

- Integrated Dielectric Waveguide and Semiconductor Layer
- Orthogonal Mode Laser Gyro
- Misfit Dislocation Free Quantum Dot Lasers

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