



## Loss Modulated Silicon Evanescent Lasers

Tech ID: 18965 / UC Case 2009-428-0

### BRIEF DESCRIPTION

Two novel alternative methods for modulating semiconductor lasers that enable much higher frequency modulation.

### BACKGROUND

Semiconductor lasers are usually modulated by changing the current to the laser, which changes the gain and causes the light output to change. The bandwidth of this is limited by the relaxation oscillation frequency and is typically 10 to 40 GHz.

### DESCRIPTION

Researchers at the University of California, Santa Barbara have developed two novel alternative methods for modulating semiconductor lasers that enable much higher frequency modulation. Rather than modulating the incoming current to the laser, the researchers propose modulating the loss in the cavity. This results in much faster modulation. Alternatively, in a ring laser significant impacts on modulation can be made by adding a second arm. By modulating the phase of light in this section, the light in the ring can add or subtract from the light in the separate arm. Further, it may be possible to modulate both the gain and the loss using either of these techniques to minimize pattern effects or minimize chirp in the laser.

### ADVANTAGES

- ▶ Potential increases in modulation signal well over 100 GHz
- ▶ Better optical properties
- ▶ Faster modulation
- ▶ Minimize pattern effects or chirp in the laser

### APPLICATIONS

- ▶ Hybrid silicon laser
- ▶ High performance semiconductor lasers
- ▶ Optical amplifiers
- ▶ Modulators
- ▶ Photodetectors

### CONTACT

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### INVENTORS

- ▶ [Bowers, John E.](#)

### OTHER INFORMATION

#### KEYWORDS

lasers, semiconductors,  
indoptoelectronics

#### CATEGORIZED AS

- ▶ [Engineering](#)
- ▶ [Communications](#)
  - ▶ Other
- ▶ [Computer](#)
  - ▶ Hardware
- ▶ [Semiconductors](#)
  - ▶ Design and  
Fabrication

#### RELATED CASES

2009-428-0, 2009-427-1, 2009-  
537-1

## RELATED MATERIALS

"High speed modulation of hybrid silicon evanescent lasers"

(PowerPoint Presentation) - Daoxin Dai, AW Fang and John E Bowers

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,693,509	04/08/2014	2009-428

## 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
- ▶ Magneto-Optic Modulator
- ▶ Quantum Dot Photonic Integrated Circuits
- ▶ Ring Resonator-Based Optical Isolator and Circulator
- ▶ Integrated Dielectric Waveguide and Semiconductor Layer
- ▶ Orthogonal Mode Laser Gyro
- ▶ Monolithically Integrated Laser-Nonlinear Photonic Devices
- ▶ Misfit Dislocation Free Quantum Dot Lasers

