



# University of Central Florida

Technology Available for Licensing

tt.research.ucf.edu

## Linear Optical Modulator: Potentially Infinite SFDR & Multi-GHz Bandwidth

Current linear modulators offer limited bandwidth and spurious-free dynamic range (SFDR) as electro-optic modulators and power handling as directly modulated lasers—also incurring high insertion loss and high  $V_{pi}$ . Recently developed at UCF, a new linear modulator with potentially infinite SFDR and multi-gigahertz bandwidth offers possible negative insertion loss and very low  $V_{pi}$ , in the range of few millivolts, compared to existing technologies. While a conventional method for linearizing modulators uses a complicated feedforward electrical circuit to correct for nonlinearities, with still-limited SFDR, the new technology offers pure linear response without the need for a correcting circuit. This linear optical modulator is useful in signal processing, fiber optic communication, frequency comb sources, computer interconnect, radio frequency communication, and radio frequency synthesis.

### Technical Details

The new linear optical modulator achieves a linear response by phase modulating the output of an injection locked slave laser, or modulating the resonance of an injection locked slave laser, and combining the modulated output with the injection source signal from the master laser.

The modulator uses a resonant cavity in one arm of a Mach Zehnder interferometer. The output frequency of the resonant cavity device, the same as the injected signal, collects a phase related to the frequency difference—the resonant cavity frequency and the detuning of the injected cavity frequency, leading to the arcsine of the detuning. Combining the arcsine phase modulated signal with a coherent signal creates a detected signal following the standard interferometer expression.

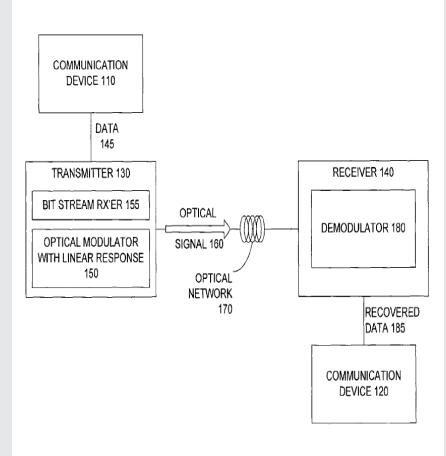
### UCF Inventors

Peter Delfyett, Ph.D.; Josue Davila-Rodriguez; Nazanin Hoghooghi

### Patent Application Pub. No's

US 12/0251129 A1

WO 11/031337 A1



### Benefits

- Potentially infinite SFDR
- Multi-GHz bandwidth
- Negative insertion loss
- Very low  $V_{pi}$
- No need for a correcting circuit

### Applications

- Signal processing
- Fiber optic communication
- Frequency comb sources
- Computer interconnect
- Radio frequency communication and synthesis

### Tech Fields

Optics & Lasers

### Keywords

linear optical modulator, spurious-free dynamic range, SFDR, signal processing, fiber optic communication, frequency comb, computer interconnect, radio frequency, Mach Zehnder interferometer

**If you or your company are interested in this opportunity, Contact:**

John Miner | 407.882.1136 | John.Miner@ucf.edu | Tech ID#32389

UCF Office of Technology Transfer | 12201 Research Parkway, Suite 501, Orlando, FL 32826