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# Crystal Orientation Optimized Optical Frequency Shifter

Tech ID: 27333 / UC Case 2017-363-0

## ABSTRACT

Researchers at the University of California, Davis have developed an optimized frequency shifter and polarization converter for power reduction.

## FULL DESCRIPTION

Optical frequency shifters have a wide variety of applications including heterodyne sensors, atomic interrogation, light detection and coherent optical communications. For these applications, the frequency shifters need to achieve near complete carrier suppression and high conversion efficiency. Current methods include electro-optic modulation and mechanically rotating half-plate frequency shifters, neither of these methods can attain high-speed frequency shifts and both consume large amounts of energy. There is a need for frequency shifters that can attain high-speed frequency shifts and achieve near complete carrier suppression with a high conversion efficiency.

Researchers at the University of California, Davis have developed an X-cut Y-propagating crystal frequency shifter and polarization converter to reduce power consumption. The X-cut Y-propagating crystal orientation makes it possible to reduce power consumption by eight times. The Integrated polarization converter and frequency shifter also allows for high-speed frequency shifts. Finally, the waveguide structure nulls the intrinsic birefringence in the material, achieving near complete carrier suppression.

## APPLICATIONS

- ▶ Highly efficient, compact frequency shifter and polarization converter

## FEATURES/BENEFITS

- ▶ Reduces power consumption by 8x
- ▶ Integrated polarization converter and frequency shifter
- ▶ Waveguide structure designed to null intrinsic material birefringence
- ▶ Can be integrated with optical components such as lasers

## PATENT STATUS

| Country                  | Type          | Number     | Dated      | Case     |
|--------------------------|---------------|------------|------------|----------|
| United States Of America | Issued Patent | 10,203,528 | 02/12/2019 | 2017-363 |

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## OTHER INFORMATION

### KEYWORDS

polarization converter, X-cut Y-propagating crystal, frequency shifter

### CATEGORIZED AS

- ▶ **Optics and Photonics**
  - ▶ All Optics and Photonics
- ▶ **Communications**
  - ▶ Optical
- ▶ **Sensors & Instrumentation**
  - ▶ Other

### RELATED CASES

2017-363-0

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Higher-Speed and More Energy-Efficient Signal Processing Platform for Neural Networks
- ▶ Multi-Wavelength, Nanophotonic, Neural Computing System
- ▶ Athermal Nanophotonic Lasers
- ▶ Athermal Silicon Photonics With CMOS Compatibility
- ▶ Photonic-Electronic, Real-Time, Signal Processing
- ▶ Ultra-High Resolution Multi-Platform Heterodyne Optical Imaging

- ▶ Multi-Wavelength, Laser Array
- ▶ Optical Interposers for Embedded Photonics Integration
- ▶ Development of a CMOS-Compatible, Nano-photonic, Laser
- ▶ Energy Efficient and Scalable Reconfigurable All-to-All Switching Architecture
- ▶ Compressive High-Speed Optical Transceiver
- ▶ All-Optical Regenerators
- ▶ Silicon Based Chirped Grating Emitter for Uniform Power Emission
- ▶ Energy-Efficient All-Optical Nanophotonic Computing

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