Ultra-High Resolution Multi-Platform Heterodyne Optical Imaging

Tech ID: 27327 / UC Case 2016-418-0

ABSTRACT

Researchers at the University of California, Davis have developed a new technique for achieving ultra-high resolution heterodyne synthetic imaging across multiple platforms (e.g. multiple satellites) using optical frequency comb sources.

FULL DESCRIPTION

Satellite-based imaging systems capture images of objects located significantly far away at high resolution. High resolution images are typically achieved by using a single large lens however a large lens is relatively expensive and heavy. Alternatively, researchers have been developing synthetic-aperture imaging systems that gather images from multiple platforms and combine them into a single high-resolution image equivalent to a single large aperture. So far, synthetic aperture systems have been limited in use due to the complex active optics required to coherently combine the optical signals from the collector optics. Heterodyne imaging system can address the complexity of the optics but requires an absolute calibration and stability of optical sources. Therefore, there is a need for a satellite-based heterodyne imaging system that does not suffer from absolute calibration and image instability.

Researchers at the University of California, Davis have invented a new method of achieving heterodyne optical imaging across multiple platforms (e.g. multiple satellites). By placing a self-referenced precise and low noise optical frequency comb source at each platform, image sources will have an absolute and stable optical frequency reference. The self-referenced optical frequency comb can achieve stability of better than 1E-13 over 1 second which, with simple electronics or signal processing, can monitor drift in phase of frequency comb lines. The system can then combine the individual signals to create an image of ultra-high resolution.

APPLICATIONS

- Multi-platform resolution imaging

FEATURES/BENEFITS

- Self-referenced optical frequency comb stabilization
- High resolution images
- Large number of wavelengths at channel spacing comparable to the electronic bandwidth of detectors
- Detection across the entire optical spectrum can be achieved using many parallel detectors of typical detector bandwidths (~ GHz)

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,995,581	06/12/2018	2016-418

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INVENTORS

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OTHER INFORMATION

KEYWORDS

multi-platform, optical frequency combs, satellite imaging, ultra-high resolution heterodyne synthetic imaging

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Communications**
  - Optical
- **Imaging**
  - Other
- **Sensors & Instrumentation**
  - Other
  - Position sensors

RELATED CASES

2016-418-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Higher-Speed and More Energy-Efficient Signal Processing Platform for Neural Networks

- Crystal Orientation Optimized Optical Frequency Shifter
- Hyperspectral Compressive Imaging
- Athermal Nanophotonic Lasers
- Photonic-Electronic Convolutional Neural Networks
- Multi-Wavelength, Laser Array
- Optical Interposers for Embedded Photonics Integration
- Ultrahigh-Bandwidth Low-Latency Reconfigurable Memory Interconnects by Wavelength Routing
- Development of a CMOS-Compatible, Nano-photonic, Laser
- Energy Efficient and Scalable Reconfigurable All-to-All Switching Architecture
- Compressive High-Speed Optical Transceiver
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- Tensorized Optical Neural Network Architecture
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- All-To-All Interconnection With Wavelength Routing Devices
- 3D Photonic and Electronic Neuromorphic Artificial Intelligence
- Adapting Existing Computer Networks to a Quantum-Based Internet Future

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