

# Ultra-High Resolution Multi-Platform Heterodyne Optical Imaging

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## 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

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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

- ▶ 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)

RELATED CASES

2016-418-0

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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- ▶ [Crystal Orientation Optimized Optical Frequency Shifter](#)
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