Novel Terahertz Sensing System
Technology #14073

Applications

This invention is a terahertz sensing system and its remote sensing applications, including explosive
detection, vibrometry, concealed weapons detection, hyper-spectral imaging, and medical imaging.
The sample’s composition can be acquired by analyzing the reflection, scattering, and absorption
spectra in the terahertz region.

Problem Addressed

Detecting terahertz radiation is extremely slow and difficult process, which is why a need exists for
improved systems for and methods of sensing terahertz radiation. Also prior systems with serial
architectures are limited to detecting stationary objects.

Technology

The invented system collects terahertz radiation scattered from a target and upconverts the
collected radiation to optical frequencies. A frequency-domain spectrometer senses spectral
components of the upconverted signal in parallel to produce a spectroscopic measurement of the
entire band of interest in a single shot. The detected spectrum can then be used to derive
information about spectroscopic characteristics of the sample. Because the spectrometer detects
different spectral components of the measurement signal in a parallel manner, the system can
measure moving samples and fast events.

Advantages

- Can measure a complete spectrum once per pulse, resulting in much higher scan speeds (e.g.,
thirty times higher if the system measures thirty frequency components in parallel) due to its
parallel architectures
- Can detect moving object due to the ability to measure a spectrum on a “single shot” basis
- Can measure terahertz spectra at standoff, making them better suited to concealed weapons
detection and other imaging applications

Categories For This Invention:

Lincoln Laboratory
Photonics
Sensors (Photonics)
Imagers
Life Sciences
Imaging
Intellectual Property:
Terahertz sensing system and method
Issued US Patent
9,200,959
Terahertz sensing system and method
Issued US Patent
8,514,393

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