Analytical Instrumentation, Methods & Materials

Compact Spectrometer

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Inventors: Zongfu Yu

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a robust optical spectrometer with few or no moving parts.

Overview

Spectrometers are optical instruments used to measure light. They work by detecting spectral lines and measuring their wavelength or intensity. Spectrometers have many applications, including telecommunications, where they can be used to test optical filters.

Conventional spectrometers rely on interference to differentiate incoming light. Interference typically is created using bulky gratings or Fourier transform interferometers, which have mirrors and complex alignment controls. Resolution is limited to the spatial size of the device.

As a result, achieving very fine resolution may require a large device and complex machinery to move parts during the measurement process. This makes low-cost, compact spectrometers difficult to produce.

The Invention

A UW–Madison researcher has developed a more compact and easily manufactured optical spectrometer. Specifically, the new design includes a filter system that receives and modifies light beams according to frequency. It generates a set of uncorrelated and varying filter spectra over an extremely short optical path. Although the filter spectra are complex and appear largely random, they can be ordered into an absorption spectrum using compressed sensing techniques.

Applications

- Telecommunications analysis and troubleshooting
- Chemical sensing

Key Benefits

- New spectrometer is compact and robust.
- High sensitivity and resolution
- Low-cost and portable
- Provides an alternative to standard diffractive or Fourier transform spectrometry
- Efficient light analysis
- Extremely short external optical path
- Manufactured using conventional techniques

Stage of Development

Accurate simulations have been performed. The researcher believes a 10-fold improvement in resolution is possible over similar devices. The on-chip array will contain approximately 400 probes and will operate in the visible light spectrum in the region typical of telecommunications applications.

Additional Information

For More Information About the Inventors

- Zongfu Yu

Tech Fields

- Analytical Instrumentation, Methods & Materials : Optics
- Analytical Instrumentation, Methods & Materials : Spectroscopy

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867