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National Aeronautics and Space Administration

Optics

Fourier Transform Spectroscopy Phase Detector/Demodulator

Synthetic quadrature phase detector/demodulator for Fourier transform spectrometers

NASA Langley Research Center and Science Applications International Corporation have developed a method of processing data from Fourier transform spectroscopy (FTS) measurements that improves upon existing methods. This method is simpler, more accurate, faster and less expensive than previous methods. It uses less hardware and can be used with all wavelengths.

BENEFITS

- Simpler: eliminates steps and hardware requirements of other methods
- Less expensive: does not require added expensive hardware like event counters
- Broader application: can be used with all wavelengths

APPLICATIONS

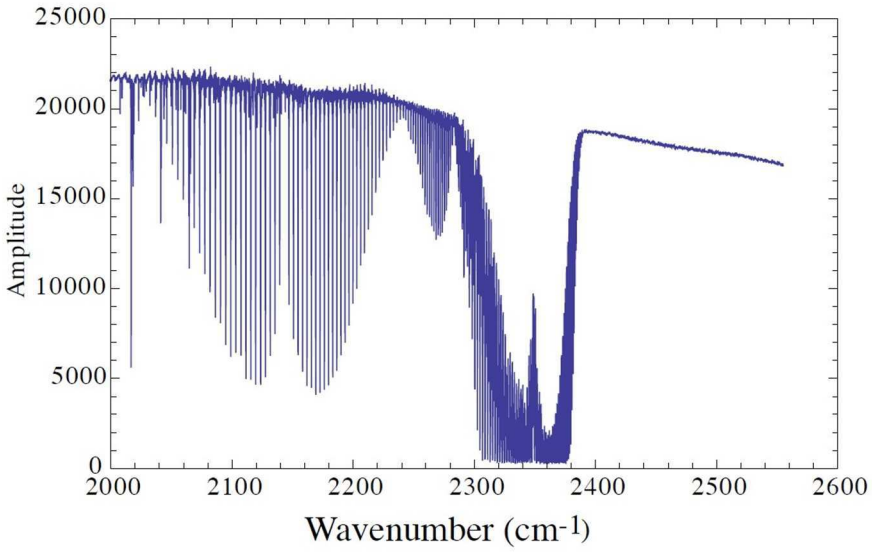
- Fourier Transform Spectrometers

technology solution

THE TECHNOLOGY

In conventional measurements, a reference laser signal runs through the device and is guided to a separate detector and triggers capture of the spectral signal. This old method restricts usable wavelengths to less than half the frequency of the laser. As part of a modification that does away with this limitation, a mirror slides along the device at a constant speed during the scan. Unavoidable velocity variations require linearization or resampling with respect to a known reference for which a metrology laser is employed. The laser is guided as before but the signal is sent to a different detector where the timing information is stored and used to mathematically velocity correct the original signal in post processing. The problem with this approach is that extra hardware, post processing and tuning are required, and the process can be somewhat difficult to perform.

This method digitizes the laser signal in a separate channel along with spectra data, which eliminates the hardware required in previous methods, then demodulates the laser signal with a synthetic quadrature phase detector combined with phase tracking to derive the proper slide position for each data point. This method only requires inexpensive 24 bit audio digitizers, rather than the more expensive event counters of the previous method. The new method does not require tuning, and high resolution data can be obtained at any wavelength.



High resolution spectra generated by method

PUBLICATIONS

Patent No: 8,693,002

More Information

National Aeronautics and Space Administration

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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