



## Continuous-Wave Laser Source for High Speed Spectroscopy

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a simple and inexpensive laser-based spectroscopy approach.**

### Overview

Measurements of emission and absorption spectra provide a valuable means of identifying and analyzing gases, liquids and solids. Fourier transform infrared (FTIR) and grating spectrometers are two common commercial tools for measuring spectra; however, both have drawbacks. Because they employ moving mirrors, FTIRs are relatively slow, with a time resolution of tens of milliseconds. Grating spectrometers rely on sophisticated and application-specific cameras, and their light throughput is low, limiting their usefulness for high resolution spectral analysis. In addition, both methods use incoherent, low-radiance light sources.

### The Invention

UW-Madison researchers have devised a simple and inexpensive laser-based spectroscopy approach that is similar to FTIR in principle; however, because it has no moving parts, it offers many advantages, including the ability to produce spectra every microsecond or faster. The laser is generally fashioned as a fiber laser, which is a laser cavity composed primarily of fiber optic cable. To measure spectra, the continuous-wave fiber output is directed at the test article and onto a single photoreceiver. The photoreceiver signal is then digitally processed to produce the desired spectra.

### Applications

- Suitable for any application where high speed sensing of spectra is needed, including high speed gas sensing in engines and medical imaging (e.g., optical coherence tomography)

### Key Benefits

- Simple and inexpensive to manufacture: Requires no camera or moving parts
- Potentially 10 times less expensive to make than an FTIR spectrometer
- Much faster than traditional FTIR spectroscopy, with a time resolution in the range of 0.1 to 10,000 microseconds
- Capable of high spectral resolution with high signal-to-noise ratios
- Extremely flexible: Can be configured for low or high resolution spectral analysis by simply adjusting the digital processing parameters
- Replaces the lamp found in traditional spectrometers with a low cost continuous-wave laser—a light source that is brighter, more efficient, and compatible with fiber optics

Lasers are coherent sources, enabling long-distance environmental probing.  
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#### For More Information About the Inventors

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#### Tech Fields

- [Analytical Instrumentation, Methods & Materials : General analytical instrumentation](#)
- [Analytical Instrumentation, Methods & Materials : Lasers](#)
- [Analytical Instrumentation, Methods & Materials : Spectroscopy](#)
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