

# Injection-Seeded High-Resolution Pulsed OPO Laser System with Singly-Resonant Non-Stabilized Cavity

**A novel, low-cost, and simplified pulsed optical parametric oscillator laser eliminates the need for complex cavity modulation, increasing the accuracy and precision of laser spectroscopic techniques for material identification.**

Spectroscopic analysis is an invaluable technique scientists use to break down molecules into their constituent atoms. A laser spectroscope works by firing a beam of single-frequency light at a sample. The electrons within the sample are excited and briefly jump to a higher energy level before emitting a photon, and falling back to the ground state. The spectroscope records the wavelength of the emitted photons and, because the energy gaps between electron orbitals are distinct from element to element, is able to atomically identify the sample. Current lasing systems must be able to constantly modulate the length of the reflecting cavity to ensure the reflected light is single frequency. This has been accomplished in the past by a fastidious and complicated piezo-electric circuit.

Purdue University researchers have developed a novel design for a pulsed optical parametric oscillator laser that is low cost and simple to construct. This design is a step forward in the field because it eliminates the need for reflecting cavity length modulation, simplifying laser fabrication and operation. The laser radiation from the system is single-frequency, which is important for increasing the accuracy and precision of a wide range of laser spectroscopic techniques.

## **Advantages:**

- Less expensive than comparable lasers
- Simpler to fabricate and operate
- Increased accuracy in laser spectroscopic techniques
- The emitted laser radiation is single frequency

## **Technology ID**

64072

## **Category**

Aerospace & National  
Security/Defense, Electronics, &  
Surveillance Technologies  
Materials Science &  
Nanotechnology/Materials  
Testing & Characterization Tools  
Biotechnology & Life  
Sciences/Analytical & Diagnostic  
Instrumentation

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## **View online**



Potential Applications:

- Identify suspicious materials in counter-terrorism operations
- Geological sample identification
- Historical painting restoration

**TRL: 8**

**Intellectual Property:**

Provisional-Patent, 2004-07-06, United States | Utility Patent, 2005-07-01, United States

**Keywords:** Spectroscopic analysis, laser spectroscope, pulsed optical parametric oscillator, single-frequency laser, low cost laser, simplified laser fabrication, laser spectroscopic techniques, counter-terrorism identification, geological sample identification, historical painting restoration, Electrical Engineering, Mechanical Engineering, Optics