# Tunable lasers to improve infrared spectroscopy

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A new development from Northwestern University's Manijeh Razeghi could be another tool for protecting our borders.

Supported by the Department of Homeland Security, Razeghi's lab has created a new, broad-band tunable infrared laser that has implications for the detection of drugs and explosives.

The robust, all solid-state laser can be rapidly tuned to emit in the wavelength range that encompasses the critical "fingerprint" region where most molecular features are absorbed and identified through infrared sensing. In experiments, the laser has demonstrated its ability to capture the unique spectral fingerprint of gases.

"The only moving part in the entire system is the fan used to keep the laser cool," said Manijeh Razeghi, Walter P. Murphy Professor of Electrical Engineering and Computer Science in Northwestern's McCormick School of Engineering. "This is a major advantage over existing systems that require mechanical parts to achieve tuning, and we expect to demonstrate remarkable stability."

The initial, patent-pending results have been published in the June 8 issue of *Scientific Reports*. The research and development of the laser system is the culmination of more than 18 years of quantum cascade laser development work at Northwestern's Center for Quantum Devices.

The laser has been integrated into a system that contains all of the laser

driver electronics and tuning software necessary for integration into a spectroscopy system. It produces a stable, single-aperture spot less than 3 millimeters in diameter that is suitable for standoff detection and is capable of linear or random access scanning with stabilization times of less than 1 millisecond per wavelength.

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**More information:** Wenjia Zhou et al. Monolithically, widely tunable quantum cascade lasers based on a heterogeneous active region design, *Scientific Reports* (2016). DOI: 10.1038/srep25213

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