Widely tunable MIR QCL eyed for spectroscopy, chemical sensing

EVANSTON, Ill. — A broadband-tunable IR laser has demonstrated the ability to capture the unique spectral fingerprints of gases. The monolithic laser technology is compact, and is expected to have applications in spectroscopy and chemical sensing.

The laser only has one moving part — a fan for cooling purposes — which Northwestern University professor Manijeh Razeghi cited as a major advantage over existing systems. Most such lasers require mechanical parts to achieve tuning. It operates in the 6.2- to 9.1-µm wavelength range with a single emitting aperture by integrating an 8-laser sampled grating distributed feedback laser array with an on-chip beam combiner, and its gain medium is based on a 5-core heterogeneous quantum cascade laser wafer.

Razeghi and her team integrated the laser 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 mm in diameter that is suitable for standoff detection and is capable of linear or random access scanning with stabilization times of less than 1 ms per wavelength.

Initial results were published in *Scientific Reports* (doi: 10.1038/srep25213).

The laser system R&D is the culmination of more than 18 years of quantum cascade laser development work at Northwestern's Center for Quantum Devices, which Photonics Media has covered continuously. The work was supported by the Department of Homeland Security Science and Technology Directorate, the National Science Foundation, Naval Air Systems Command, DARPA and NASA.

Pryometric imaging system captures explosion parameters

ADELPHIA, Md. — A technique involving high-speed, high-fidelity imaging with optical filtering and signal processing techniques may make setting off explosives and capturing the data in real time a reasonable alternative to developing theoretical simulations to test explosives.

Research chemist Kevin McNesby and colleagues at the U.S. Army Research Laboratory, Lawrence Livermore National Laboratory and Los Alamos National Laboratory have developed an optical technique to image explosions in high resolution at costs approaching computer simulations. The researchers cited increasingly fast cameras and light sensors as key enablers of high-resolution experimental imaging.

The imaging system produces information about explosive behavior by capturing multiple variables during an explosion — pressure, temperature and chemical species maps — rather than a single point measurement, requiring additional shots for each variable.

Information gathering involved pyrometry, a technique for estimating temperature of incandescent bodies based upon their spectra of emitted thermal radiation. The experimental setup,