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Single-chip mid-IR quantum-cascade laser plus amplifier is widely tunable

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Manijeh Razeghi and her colleagues at Northwestern University (Evanston, IL) have now integrated a mid-infrared (4.8 μm spectral region) electrically tuned quantum-cascade laser (QCL) with an on-chip amplifier, creating a compact package that can output more than 5 W in pulsed mode tunable over a 270 nm spectral range. A refined geometry emits 1.25 W continuous-wave (CW) with a 300 nm tuning range. Both emit a nearly diffraction-limited beam even at a high amplifier current. Adjustable wavelength output, modulators, and amplifiers are all inside a single package.[1]

With this architecture, the laser has demonstrated an order-of-magnitude more output power than its predecessors, and the tuning range has been enhanced by more than a factor of two.

With mid-infrared spectroscopy, a chemical can be identified through its unique absorption spectrum. This greatly interests government agencies that aim to detect hazardous chemicals or possible explosive threats. Because Razeghi's new system is highly directional, the high power can be used more efficiently, allowing for the greater ability to detect chemicals. It also allows for standoff application, which keeps personnel physically distant from potentially dangerous environments. The technology could also benefit free-space optical communications and aircraft protection.

The new research builds on Razeghi's many years of research with Northwestern's Center for Quantum Devices. In 2012, she developed a widely tunable, single chip, mid-infrared laser.

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Source: http://www.eurekalert.org/pub_releases/2016-01/nu-sld010716.php

REFERENCE:

1. S. Slivken et al., Applied Physics Letters 107, 251101 (2015); http://dx.doi.org/10.1063/1.4938005