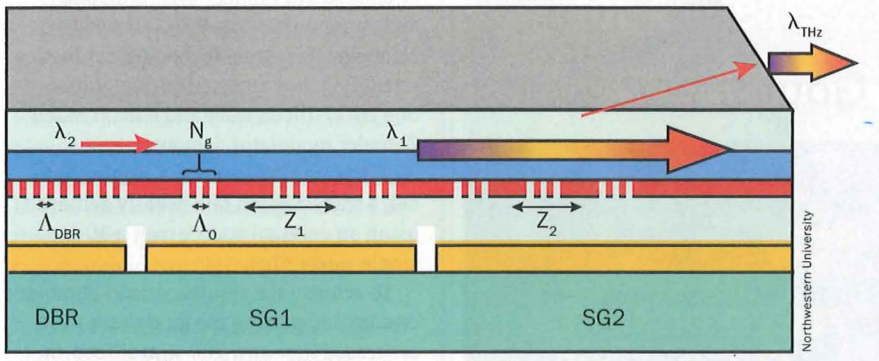
Security detection device features stable THz source

EVANSTON, Ill.— A security detection device based on a terahertz source has overcome the size, complexity and cost typical of terahertz systems. The instrument, which detects explosives, chemical agents and dangerous biological substances from safe distances, could make public spaces more secure.

"A single-component solution capable of room temperature continuous wave and widely frequency tunable operation is highly desirable to enable next generation terahertz systems," said Northwestern University professor Manijeh Razeghi.

Razeghi and her team based their system on nonlinear mixing in quantum cascade lasers. The system achieved room temperature CW emission at 3.41 THz with a side-mode suppression ratio of 30 dB and output power up to 14 μW, with a wall-plug efficiency about one order of magnitude higher than previous demonstrations.

With their design, they produced CW single-mode THz emissions with a wide frequency tuning range of 2.06 to 4.35 THz and an output power up to 4.2 μW from two monolithic 3-section sampled grating distributed feedback-distributed Bragg reflector lasers.



Schematic design of professor Manijeh Razeghi's terahertz tuning source. DBR = distributed Bragg reflector. SG = sample grating.

This research builds upon Razeghi and her group's many years of research with Northwestern's Center for Quantum Devices, including the development of the first single mode room temperature terahertz laser in 2011. The work was funded by the National Science Foundation, Department of Homeland Security, Naval Air Systems Command and NASA, and was published in *Nature Scientific Reports* (doi: 10.1038/srep23595).

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