

# 2<sup>nd</sup> International Conference and Exhibition on **Lasers, Optics & Photonics**

September 08-10, 2014 Hilton Philadelphia Airport, USA

## Electrically tunable quantum cascade lasers for broadband applications

Steven Slivken and Manijeh Razeghi  
Northwestern University, USA

Mid-infrared laser sources (3-14  $\mu\text{m}$ ) which have wide spectral coverage and high output power are attractive for many applications. This spectral range contains unique absorption fingerprints of most molecules, including toxins, explosives, and nerve agents. Infrared spectroscopy can also be used to detect important biomarkers, which can be used for medical diagnostics by means of breath analysis. Many groups are actively trying to build systems that can cover the entire range of interest. To realize this type of extreme range requires both a broad gain bandwidth and a dynamic wavelength selection. The quantum cascade laser has demonstrated the ability to achieve very large spectral bandwidths via band structure engineering. Our group is currently developing heterogeneous core technology for broadband gain coverage in a single device. Broadband tuning, at least commercially, is realized with external cavity devices. These are fairly complicated optomechanical devices, however, which come with inherent size, speed, and stability limitations. As an alternative, our group is developing multi-section laser geometries with wide electrical tuning (hundreds of  $\text{cm}^{-1}$ ). These devices are roughly the same size as a traditional quantum cascade laser, but tuning is accomplished without any external optical components. This talk will describe our current research efforts and potential for both broadband spectral coverage and broadband electrical tuning. The goal is to produce a broadband mid-infrared source which is smaller, lighter, more robust, and less expensive than what is currently available.

### Biography

Steven Slivken completed his PhD in 2002 from Northwestern University. He is currently a Research Associate Professor at Northwestern University. His research is focused on mid-infrared lasers, optoelectronics, and applications of this technology. He has published 77 papers in peer-reviewed journals.

[s-slivken@northwestern.edu](mailto:s-slivken@northwestern.edu)