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Characterization of new type-I quantum well cascade lasers

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In recent years, there has been an enormous amount of research into the development of mid-IR lasers. The uses of these lasers are numerous and varied: Trace gas detection, battery powered spectroscopy, free-space communication, and remote sensing are a few examples currently being studied. Quantum Cascade Lasers (QCLs) are capable of reaching Watt level output power at room temperature, cw operation but are limited to the spectral region of above 3.5 microns. Recently, Shterengas et al fabricated type-I quantum well cascade diodes that emit below 3 microns with output power near 590 mW and improved conversion efficiency compared to single-stage type-I diodes. This novel advance in cascade laser technology makes it possible, for the first time, to produce a sub 3.0 micron laser beam at multi-Watt power levels via type-I quantum wells with a cascade pumping scheme. GaSb-based type-I quantum well heterostructures exhibit strong electron/hole confinement (minimizes thermal issues), large refractive index contrast (maximizes optical confinement), and minimized threshold carrier concentration (minimizes Auger recombination). In this study, a careful characterization of the properties of these new cascade lasers was conducted. Current, voltage, and output power were measured up to room temperature in multiple lasers. Spectral characteristics were measured both below and above the laser threshold point under a variety of conditions. A detailed discussion of the temperature and bias dependent characteristics as well as a thorough description of the new type-I quantum well heterostructure will be given in the presentation.

Biography

Sherrie S Bowman completed her PhD from The Ohio State University in 2013. She is now a National Research Council Post-Doctoral Fellow conducting research at the Army Research Lab in Adelphi, MD. Her research focuses on understanding the optical and physical properties of cascade lasers as well as their development.

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