Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

High Efficiency Quantum Cascade Lasers[1] MATTHEW ESCARRA, ANTHONY HOFFMAN, SCOTT HOWARD, KALE FRANZ, AISHWARYA SRIDHAR, CLAIRE GMACHL, Princeton University — Quantum cascade (QC) lasers have proven to be of great interest as powerful and versatile mid-infrared light sources. However, improvement in the wall-plug efficiency of these sources at room temperature and under continuous wave operation is critical to their development across a broad range of sensing applications. The internal, current, voltage, and optical efficiencies all must be maximized. Several different approaches must be taken in conjunction. We will focus primarily on several QC laser designs with low voltage defect. Low voltage defect quantum designs with heterogeneous injector regions have shown efficiencies as high as 13.9% from a single facet in 80K, pulsed operation. Performance at high temperatures can be improved by better confinement of electrons in the upper laser level. The addition of high-reflection and anti-reflection coatings to opposing facets has greatly improved the optical efficiency. Temperature performance can also be improved through InP lateral regrowth, epi-side down mounting, and electroplated gold top contacts.

[1]This work is supported in part by DARPA-EMIL and MIRTHE (NSF-ERC).

Matthew Escarra
Princeton University

Date submitted: 26 Nov 2007 Electronic form version 1.4