Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Modeling of Quantum Cascade lasers with different waveguide profiles[1] CHARLES ZHANG, RICHARD CENDEJAS, CLAIRE GMACHL, Princeton University — Quantum Cascade (QC) laser-based sensor systems help us monitor the environment through the detection of trace chemicals that have optical spectra in the mid-infrared. For the laser to become more efficient and usable, the thermal management and the optical and electrical properties of the laser waveguides need to be more closely examined. The performances of QC lasers with different waveguide profiles have so far not been systematically compared and the device optimization for the three design components has not yet been coupled together. Here, we use a finite element solver to calculate the active region peak core temperature, the optical confinement factor and waveguide loss, and the local current density, and compare these for QC lasers with dry- and wet-chemical etch profiles, i.e. with vertical or sloped sidewalls, respectively. Initial results show a preference for wet-etched profiles under thermal conductivity considerations.

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

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Date submitted: 26 Nov 2010 Electronic form version 1.4