Abstract Submitted
for the MAS17 Meeting of
The American Physical Society

Quantum Cascade Superluminescent Spiral Cavity Devices at 8 μm with Various Doping Characteristics[1] YEZHEZI ZHANG, MEI ZHENG, Princeton University, ABIGAIL PITARRESI, Lafayette College, ABANTI BASAK, DEBORAH SIVCO, CLAIRE GMACHL, Princeton University — Optical Coherence Tomography (OCT) is an imaging technique with biomedical applications; the system requires a superluminescent (SL) light source that has a low temporal coherence for high resolution and high power for imaging through a thicker sample. We focus on the mid-IR region because many fundamental ro-vibrational transitions happen in this 'fingerprint' region. Quantum cascade superluminescent (QCSL) emitters are excellent sources for this wavelength. Prior work dealt with QCSL devices with an emission wavelength of 5 μm, and in this work we extended our work to 8 μm because there are more interesting biomolecular absorption peaks from proteins and lipids. We designed and fabricated 8 μm spiral cavity SL emitters with various doping characteristics. Using FT-IR spectrometry, the devices were characterized at various temperatures. Compared to injector region doped devices, active region doped devices showed a slower gain narrowing in the electroluminescent region. Doping in the active region contributes to suppressed lasing, but it does not affect the coherence length that was 320 μm for both type of devices at lasing threshold at 120 K. The active region doped device had a 7.5 mW power output at 120 K, which makes it a good candidate for an OCT system.

[1]This material is based upon work supported by the National Science Foundation under Grant No. EEC-0540832. M. C. Zheng is also supported by the NDSEG fellowship.

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Date submitted: 29 Sep 2017 Electronic form version 1.4