New frontiers in Quantum Cascade Lasers: Single mode, High Power, Broadband Tuning, Beam engineering

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Quantum Cascade Lasers (QCLs) represent a radical departure from diode lasers in that they don't rely on the bandgap for light emission. This freedom from "bandgap slavery", and their attendant unipolar nature leads to unprecedented design flexibility and functionality broadly impacting sensing, spectroscopy, atmospheric chemistry and high power applications such infrared countermeasures.[1,2,3] I will focus on recent developments in my group on single mode Master Oscillator Power Amplifier (MOPA) QCLs[4] and in MOPA QCL array technology[5,6] with single mode, high power, broadband tuning, as well on high-brightness tapered single mode QCLs[7] and low-divergence collimated high power QCLs using plasmonics.[8]

1. F. Capasso, *Journal of Optical Engineering* **49**, 111102 (2010)
2. R. Curl et al. *Chemical Physics Letters* **487**, 1 (2010)
3. N.Yu, Qijie. Wang, F. Capasso, *Laser & Photonics Reviews* **6**, 24 (2012)
4. S. Menzel et al. *Optics Express* **19**, 16229 (2011)
5. P. Rauter et al. *Appl. Phys. Lett.* **101**, 261117 (2012)
6. P. Rauter et al. *Optics Express* **21**, 4518 (2013)
7. P. Rauter et al. *Appl. Phys. Lett* **102**, 181102 (2013)
8. R. Blanchard et al. *Appl. Phys. Lett.* **102**, 191114 (2013)