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High Performance Quantum Cascade Lasers[1] MATTHEW ESCARRA, PETER LIU, YU YAO, RICHARD CENDEJAS, LOAN LE, CLAIRE GMACHL, Princeton University, MIRTHE NSF-ERC TEAM — Quantum cascade (QC) lasers have shown great promise for use in applications ranging from trace chemical detection to infrared countermeasures. Since light is generated through intersubband transitions in coupled quantum wells, as opposed to interband transitions that are restricted by available materials, QC lasers have an enormous amount of flexibility in their design space. This flexibility allows for lasing across the mid-infrared and even in the terahertz portions of the spectrum. We report on our recent work to improve the performance of these devices, by discussing the results of low voltage defect, strong coupling, and broad gain approaches to QC laser design. One of these laser designs will be put into context through discussion of our latest work to use QC lasers for detecting CO2 isotopic concentrations in the atmosphere.

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