

Abstract Submitted
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Recent development of Second-Harmonic Generation in Quantum Cascade Laser¹ FENG XIE, ALEXEY BELYANIN, Department of Physics, Texas A&M University, DONGXIA QU, GARY SHU, CLAIRE GMACHL, Department of Electrical Engineering, Princeton University — Quantum cascade laser (QCL) has been rapidly developed in the recent decade. Integration of second harmonic generation (SHG) within the QCL enables this realization of a 3~5 μ m laser. In this talk, recent progress on SHG QCL (D3056) will be presented. The D3056 is designed to combine the resonant SHG and pump lasing within the same active region, working at 8.5 μ m (fundamental laser) and 4.2 μ m (SH signal). One interesting thing is that the linear-to-nonlinear power conversion efficiency η increased with increasing electrical current. A Couple of explanations are discussed. One is that a multi-set of three-level systems was formed due to the significant change of dipole moments between some electron energy states for various applied electrical field. The other one is that increasing of electron population at upper lasing level caused the increase of nonlinear susceptibility. Moreover, lasing at both current polarities of the D3056 is a beneficial side effect of this active region design.

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