Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Coherently driven double-quantum dot at finite bias: Analogy with lasers and beyond MANAS KULKARNI, OVIDIU COTLET, YINYU LIU, KARL PETERSSON, GEORGE STEHLIK, JASON PETTA, HAKAN TURECI, Princeton University — Hybrid circuit-QED systems consisting of a double-quantum dot (DQD) coupled to a microwave resonator provide a unique platform to explore non-equilibrium impurity physics with coupled light-matter systems. We present a theoretical and experimental study of photonic and electronic transport properties of such a system. We obtain a Hamiltonian and the Liouvillian super-operators considering systematically both the presence of phonons and the effect of leads at finite voltage bias. We subsequently derive analytical expressions for transmission, phase response, photon number and nonequilibrium steady state electron current and show that the system realizes an unconventional version of a single-atom laser. Our analytical results are compared to numerically exact ones establishing regimes of validity of various analytical models. Finally, we compare our findings to experimental measurements.

Manas Kulkarni
Princeton University

Date submitted: 14 Nov 2013 Electronic form version 1.4