Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Single-artificial-atom lasing using a voltage-biased superconducting charge qubit ROBERT JOHANSSON, RIKEN, SAHEL ASHHAB, RIKEN, Univeristy of Michigan, ALEXANDRE ZAGOSKIN, Loughborough University, FRANCO NORI, RIKEN, Univeristy of Michigan — We consider a system composed of a single artificial atom coupled to a cavity mode. The artificial atom is biased such that the most dominant relaxation process in the system takes the atom from its ground state to its excited state, thus ensuring population inversion. Even under this condition, lasing action can be suppressed if the 'relaxation' rate, i.e. the pumping rate, is larger than a certain threshold value. Using simple transition-rate arguments and a semiclassical calculation, we derive analytic expressions for the lasing suppression condition and the state of the cavity in both the lasing and suppressed-lasing regimes. The results of numerical calculations agree very well with the analytically derived results. Our analysis and results are relevant to the recently realized superconducting artificial-atom laser. [arXiv:0803.1209]

Robert Johansson
RIKEN

Date submitted: 21 Nov 2008 Electronic form version 1.4