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Photon emission from a cavity-coupled double quantum dot[1] Y.-Y. LIU, K.D. PETERSSON, J.R. PETTA, Princeton University, J.M. TAYLOR, Joint Quantum Institute and NIST — Circuit quantum electrodynamics (cQED) allows strong coupling between a microwave photon and a superconducting qubit. We recently demonstrated coupling of a double quantum dot (DQD) spin qubit to a high quality factor cavity in the cQED architecture, with a charge-cavity coupling rate of 30 MHz. Here we explore the same system, but with a finite source-drain bias applied across the DQD, which forces electrons to tunnel through the device. For specific experimental conditions, we observe gain in the cavity transmission. Moreover, in the absence of an input field, we directly measure photon emission from the cavity-coupled DQD. Our results are inconsistent with existing theoretical models, suggesting that contributions from phonons or cotunneling may be necessary to quantitatively describe the gain mechanism.

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