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Relaxation Dynamics of Fock States in a High Q Microwave Resonator Coupled to a Superconducting Phase Qubit HAOHUA WANG, MAX HOFHEINZ, MARKUS ANSMANN, RADOSLAW BIALCZAK, ERIK LUCERO, MATTHEW NEELEY, AARON O'CONNELL, DANIEL SANK, JIM WENNER, ANDREW CLELAND, JOHN MARTINIS, Department of Physics, University of California, Santa Barbara — We have improved the lifetime of our high Q microwave resonator that is coupled to a superconducting phase qubit. Using high speed electronics, we have successfully generated Fock states with up to 15 photons. We analyze the resonator number state using the qubit to verify the high purity of the Fock states. Finally we monitor the subsequent decay of the Fock states in time, and show that the decay matches that expected from theory, with the n-photon lifetime scaling as T_1/n, where T_1 is the one-photon lifetime. Measurements on the decay of the coherent states, generated in the resonator using classical pulses, are also in agreement with theory.

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