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Catching Microwave Photons in a Superconducing Resonator with Tunable Coupling JAMES WENNER, YI YIN, YU CHEN, R. BARENDS, B. CHIARO, J. KELLY, M. MARIANTONI, A. MEGRANT, J. MUTUS, C. NEILL, S. OHYA, D. SANK, T. WHITE, A.N. CLELAND, JOHN M. MARTINIS, University of California, Santa Barbara — When transferring a quantum state from a freely propagating mode to a resonator, reflections must be minimized to avoid energy loss. Performing this transfer with high fidelity requires tunable coupling. We experimentally studied a 50 Ohm transmission line with tunable coupling to a 6GHz superconducting coplanar waveguide resonator, which in turn is capacitively coupled to a phase qubit for calibration. We classically drove the resonator while measuring the reflected and captured signals using a HEMT amplifier. Following theory by Korotkov (PRB 84, 014510, 2011), we find that the photon capture efficiency is maximized with an exponentially increasing drive; further improvements come from varying pulse duration and dynamic coupling. With these techniques, we reduce reflections so that presently over 80% of the pulse energy is captured by the resonator.

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