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Catching Classical Shaped Microwave Photons in a Superconducing Resonator with 99.4% Efficiency JAMES WENNER, University of California, Santa Barbara, Y. YIN, Zhejiang University, Y. CHEN, R. BARENDS, B. CHIARO, E. JEFFREY, J. KELLY, A. MEGRANT, J. MUTUS, C. NEILL, P. O'MALLEY, P. ROUSHAN, D. SANK, A. VAINSENCHER, T. WHITE, University of California, Santa Barbara, ALEXANDER N. KOROTKOV, University of California, Riverside, A.N. CLELAND, JOHN M. MARTINIS, University of California, Santa Barbara — Deterministic quantum state transfer requires receivers to transfer quantum states from traveling qubits to fixed logic qubits. Reflections must be minimized to avoid energy loss and phase interference. Here, we classically drive a 6GHz superconducting coplanar resonator with tunable coupling to the drive/readout line while we measure the reflected and captured signals with a HEMT amplifier. Using an exponentially increasing drive pulse, we demonstrate a 99.4% deterministic single photon absorption efficiency (97.4% receiver efficiency). We further demonstrate that experimental absorption efficiencies agree with theory within 3% for various pulse parameters and shapes. With the fidelity now at the error threshold for fault tolerant quantum communication (96%) and computation (99.4%) and comparable to fidelities of good logic gates and measurements, new designs may be envisioned for quantum communication and computation systems.

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