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Observation of single artificial atom optical bi-stability and its application to single-shot readout in circuit quantum electrodynamics LUYAN SUN, Department of Physics and Applied Physics, Yale University, ERAN GINOSSAR, Advanced Technology Institude and Department of Physics, University of Surrey, MIKHAEL GUY, MATTHEW REED, HANHEE PAIK, Department of Physics and Applied Physics, Yale University, LEV S. BISHOP, Joint Quantum Institute and Condensed Matter Theory Center, Department of Physics, University of Maryland, ADAM SEARS, ANDREI PETRENKO, TERESA BRECHT, LUIGI FRUNZIO, STEVEN GIRVIN, ROBERT SCHOELKOPF, Department of Physics and Applied Physics, Yale University — The high power transient behavior of superconducting qubit-cavity systems has recently been used to perform high fidelity readout of transmon qubits [1]. We show that in the steady state, the system exhibits a bi-stable behavior that can be observed on the single-shot level, with the cavity state switching stochastically between dim and bright states. The switching times are shown to be long compared to the cavity and qubit lifetimes. Some features of the bi-stability can be explained by mean field theory, while its switching dynamics is studied with large scale simulations. Understanding these dynamics will be crucial for studying the transient response, an essential aspect of the qubit readout. We will discuss progress on optimizing readout by shaping the measurement pulse.

[1] M. D. Reed, L. DiCarlo, B. R. Johnson, L. Sun, D. I. Schuster, L. Frunzio, and R. J. Schoelkopf, Phys. Rev. Lett. 105, 173601 (2010)

Luyan Sun
Department of Physics and Applied Physics, Yale University

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