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Resonance fluorescence from an artificial atom in squeezed vacuum, Part 1: Efficient fluorescence detection[1] A. EDDINS, D.M. TOYLI, Quantum Nanoelectronics Laboratory, UC Berkeley, S. PURI, S. BOUTIN, Departement de Physique, Universite de Sherbrooke, D. HOVER, V. BOLKHOVSKY, MIT Lincoln Laboratory, W.D. OLIVER, MIT Lincoln Laboratory and Research Laboratory of Electronics, Massachusetts Institute of Technology, A. BLAIS, Departement de Physique, Universite de Sherbrooke, I. SIDDIQI, Quantum Nanoelectronics Laboratory, UC Berkeley — The accurate prediction of the fluorescence spectrum of a single atom under coherent excitation, comprising canonical phenomena such as the Mollow triplet, is a fundamental success of quantum optics. Despite considerable efforts, experiments demonstrating a strong modification to the resonance fluorescence spectrum resulting from driving an atomic system with non-classical squeezed light have remained elusive, in part due to challenges in efficient coupling. In this talk, we discuss how we strongly couple microwave-frequency squeezed light to a superconducting artificial atom and detect the resulting fluorescence using a Josephson traveling-wave parametric amplifier (JTWPA). Whereas alternative detection techniques require extensive experimental hardware and long averaging times to resolve fluorescence, the large dynamic range and GHz bandwidth of the JTWPA facilitate direct detection of the Mollow triplet with a spectrum analyzer in minutes, enabling a systematic study with respect to the properties of squeezed vacuum.

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