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Dispersive single photon non-linear optics with circuit QED DAVID I. SCHUSTER, STEVEN M. GIRVIN, ROBERT J. SCHOELKOPF, Yale University, YALE CIRCUIT QED TEAM TEAM — Circuit quantum electrodynamics couples a superconducting qubit to a high quality factor microwave cavity[1]. The strong coupling limit is reached when the cavity is resonant with the qubit, and the interaction between them dominates over decoherence[2]. If in addition, when the qubit and cavity are far off resonance, the dispersive frequency shifts are still larger than the decay rates, then the strong dispersive limit will be reached. In this regime, the qubit absorption spectrum resolves into individual photon number peaks[3]. The dual of this photon numbersplitting is that the cavity inherits some of the non-linearity of the qubit. This inherited non-linearity can be used to create photonic qubits and create quantum states of light in the cavity. [1] Blais, et. al. PRA, 2004, 69, 062320 [2] Wallraff, et. al. Nature, 2004, 431, 162 [3] Schuster, et. al. Nature, 2006, in press

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