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Eliminating the Purcell Effect in Circuit QED MATTHEW REED, LEV BISHOP, LEONARDO DICARLO, LUIGI FRUNZIO, ERAN GINOSSAR, Yale University, ANDREW HOUCK, Princeton University, BLAKE JOHNSON, DAVID SCHUSTER, STEVEN GIRVIN, ROBERT SCHOELKOPF, Yale University — In circuit QED, it is desirable to have both a long qubit coherence time and a short microwave cavity lifetime in order to perform a high fidelity qubit measurement [1]. However, when a qubit is strongly coupled to a fast cavity, its lifetime is limited by spontaneous emission due to the multi-mode Purcell effect [2]. We present measurements of a new device in which the normal rate of spontaneous emission is reduced by more than an order of magnitude over a wide range of qubit frequencies. The single-shot readout fidelity of the transmon qubit in this device, which is strongly coupled ($g/2\pi$ ∼300MHz) to a fast cavity ($\kappa/2\pi$ ∼20MHz), will also be discussed. 1. Gambetta, Jay *et al. Phys. Rev. A* 76, 012325 (2007). 2. Houck, A. A. *et al. Phys. Rev. Lett.* 101, 080502 (2008).

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