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A scheme for enhanced light collection from a trapped ion[1]
JONATHAN STERK, PETER MAUNZ, ANDREW MANNING, CHRIS MONROE, JQI and Department of Physics, University of Maryland — By coupling a trapped ion to an optical cavity, fluorescence into a single mode can be dramatically enchanced. This not only boosts the fidelity and speed of trapped ion qubit measurement, but it also can greatly improve probabilistic entangling schemes that rely on the collection and interference of single photons [1]. We present progress towards an ion–cavity system for 369nm photon collection from a trapped Yb^+ ion. The ion will reside in a microtrap inside an optical cavity, where the ion–electrode spacing is smaller than the ion–cavity distance, which may mitigate the effect of stray fields from charged mirrors [2,3]. A single-atom cooperativity of $C \sim 0.4$ should be achievable in a one-sided cavity, yielding 10 times the number of photons collected from a free-space ion. This would permit significantly faster detection and a 100-fold increase for heralded two-photon entanglement events [1].
[1] D. L. Moehring, et. al. *Nature* **449**, 68 (2007)
[2] G. Guthorlein, *et al.*, *Nature* **414**, 49 (2001)
[3] A. B. Mundt, *et al. Phys. Rev. Lett.*, **89**, 103001, (2002)

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