Abstract Submitted for the MAR08 Meeting of The American Physical Society

Charged Quantum Dots in High Quality Micropillar Cavities<sup>1</sup> MATTHEW RAKHER, Physics Dept., University of California Santa Barbara, NICK STOLTZ, LARRY COLDREN, PIERRE PETROFF, Materials Dept., University of California Santa Barbara, DIRK BOUWMEESTER, Physics Dept., University of California Santa Barbara — We report on nanodevices that for the first time allow for charge tuning of single InAs quantum dots located near the field maximum of high quality micropillar cavities. Through the innovation of a novel trench style cavity design, we are able to embed doped layers for electrical gating within a microcavity and obtain Q values greater than 50,000. Using these devices, we demonstrate record high single photon count rates with a capture efficiency of 38%and a Purcell effect up to 8. We also show high frequency polarization modulation of single photons enabled by Stark shift tuning a charged quantum dot between two polarization modes of a slightly elliptical micropillar with frequencies up to 100 KHz. Furthermore, we demonstrate a charge tunable quantum dot coupled to a micropillar cavity mode, which is an important step in quantum communication protocols involving trapped single electrons or holes. This type of device enables a quick, non-destructive measurement of the spin state of the trapped charge.

<sup>1</sup>NSF NIRT Grant No. 0304678

Matthew Rakher Physics Dept., University of California Santa Barbara

Date submitted: 16 Nov 2007

Electronic form version 1.4