

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Distinct single photons strongly interacting at a single atom in a waveguide PAVEL KOLCHIN, RUPERT F. OULTON, XIANG ZHANG, University of California at Berkeley — We propose a waveguide QED system where two distinct single photons can interact strongly. The system consists of a single ladder-type three level atom coupled to a waveguide. We show that the nonlinear interaction can be tremendously enhanced by the strong coupling of the cascade atomic transitions to the waveguide mode simultaneously. As a result, a control photon tuned to the upper transition induces a π phase shift and tunneling of a probe photon tuned to the otherwise reflective lower transition. Waveguide QED schemes could be an alternative to high quality cavities or dense atomic ensembles in quantum information processing.

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Date submitted: 08 Dec 2010

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