Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Chip-Based Optical Interactions with Rubidium Vapor KASTURI SAHA, PABLO LONDERO, School of Applied & Engineering Physics, Cornell University, NY 14853, JACOB LEVY, School of Electrical and Computer Engineering, Cornell University, NY 14853, AARON SLEPKOV, AMAR BHAGWAT, VIVEK VENKATARAMAN, School of Applied & Engineering Physics, Cornell University, NY 14853, MICHAL LIPSON, School of Electrical and Computer Engineering, Cornell University, NY 14853, ALEXANDER L. GAETA, School of Applied & Engineering Physics, Cornell University, NY 14853 — Chip-based optical waveguides that are evanescently coupled to strongly resonant vapors offer significant potential for realizing low-photon and single-photon nonlinear interactions in a system consistent with an integrated optics approach. We demonstrate evanescent coupling of rubidium (Rb) vapor with chip-based optically guiding silicon-nitride nanowires in a small, robust and portable set-up. We perform spectroscopy of Rb D2 resonances, with optical depths of 2 observed for the guided mode. We observe noticeable broadening and shifting of the D2 lines with respect to their free-space counterparts. This is consistent with the homogeneous broadening due to transit-time effects, and inhomogeneous broadening and shifting due to Van der Waals interactions between the atoms and the surface of the waveguide. We also demonstrate excitation of ring resonators coupled to these waveguides.

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Date submitted: 25 Jan 2010 Electronic form version 1.4