Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

**Few-Photon Switching via Two-Photon Absorption in Rb-Filled Photonic Bandgap Fibers** VIVEK VENKATARAMAN, KASTURI SAHA, PABLO LONDERO, ALEXANDER GAETA, Cornell University — We demonstrate 40% all-optical modulation with 1 nW of total power via non-degenerate two-photon absorption in Rb vapor confined to a hollow-core photonic bandgap fiber. A 780-nm beam tuned to the $5S_{1/2} \rightarrow 5P_{3/2}$ transition of Rb-85 is used to attenuate a counterpropagating 776-nm beam which is tuned to the $5P_{3/2} \rightarrow 5D_{5/2}$ transition. We observe appreciable nonlinear absorption with powers as low as 360 pW and 720 pW in the 776 nm and 780 nm beams, respectively. The Doppler-free, transit-time-limited transmission profile implies that on average only 6 and 12 photons in the 776-nm and 780-nm beams, respectively, interact with the atoms within the inferred 4.5-ns transit time. Such a system offers the potential to explore novel classical and quantum nonlinear effects at ultralow powers such as single-photon all-optical switching, the generation and measurement of non-classical states of light, and higher-order nonlinear susceptibilities.

Vivek Venkataraman
Cornell University

Date submitted: 01 Feb 2011 Electronic form version 1.4