Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Progress towards realization of quantum networks using atomic ensembles EISAMAN MATTHEW, GENE WEI LI, AXEL ANDRE, FLORENT MASSOU, ALEXANDER ZIBROV, MIKHAIL LUKIN, Harvard University — We report on our progress towards generation, storage and communication of single photon states using atomic memory. Specifically, we describe proof-of principle experiments demonstrating generation of single photon pulses of light with controllable propagation direction, timing, and pulse shapes [1]. The approach is based on preparation of an atomic ensemble in a state with a desired number of atomic spin excitations, which is later converted into a photon pulse by exploiting long-lived coherent memory for photon states and electromagnetically induced transparency (EIT). We describe our efforts to optimize the performance of such a novel single photon source. Specifically we propose and demonstrate a novel propagation geometry that optimizes mode matching and signal to noise ratio. We discuss our progress towards transmitting single photon states between two atomic memory nodes connected by photonic channels and outline the prospects for long-distance quantum communication using these techniques. [1] M. D. Eisaman, L. Childress, A. André, F. Massou, A. S. Zibrov, and M. D. Lukin, Phys. Rev. Lett. **93**, 233602 (2004).

Axel Andre
Harvard University

Date submitted: 28 Jan 2005 Electronic form version 1.4