Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Progress Towards a Quantum Memory with Telecom-Wavelength Conversion DANIEL STACK, QUDSIA QURAISHI, PATRICIA LEE, IAN GRISSOM, RONALD MEYERS, KEITH DEACON, ARNOLD TUNICK, US Army Research Laboratory — Fiber-based transmission of quantum information over long distances may be achieved using quantum memory elements and quantum repeater protocols.[1] However, atom-based quantum memories typically involve interactions with light fields outside the telecom window needed to minimize absorption in transmission by optical fibers. We report on progress towards a quantum memory based on the generation of 780 nm spontaneously emitted single photons by a write-laser beam interacting with a cold ^{87}Rb ensemble. The single photons are then frequency-converted into (via four-wave mixing in a cold Rb sample) and out of (via sum frequency generation in a PPLN crystal) the telecomm band. Finally, the atomic state is read out via the interaction of a read-pulse with the quantum memory. With such a system, it will be possible to realize a long-lived quantum memory that will allow transmission of quantum information over many kilometers with high fidelity, essential for a scalable, long-distance quantum network.

[1]Duan et al., Nature **414**, 413-418 (2001)

Daniel Stack
US Army Research Laboratory

Date submitted: 25 Jan 2013 Electronic form version 1.4