Abstract Submitted
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Progress Towards a Quantum Memory with Telecom-Wavelength Conversion[1] DANIEL STACK, QUDSIA QURAISHI, IAN GRISSOM, RONALD MEYERS, KEITH DEACON, ARNOLD TUNICK, PATRICIA LEE, US Army Research Laboratory — Fiber-based transmission of quantum information over long distances may be achieved using quantum memory elements and quantum repeater protocols.[2] However, atom-based quantum memories typically involve interactions with light fields outside the telecom window where attenuation in optical fibers is at a minimum. We report on progress towards a quantum memory based on the generation of 780 nm spontaneously emitted single photons by an off-resonant Raman beam interacting with a cold ^{87}Rb ensemble. The single photons are then frequency converted into telecom photons (via four-wave mixing in a cold Rb sample), sent through a 13 km fiber, and then converted back to 780 nm photons (via sum frequency generation in a PPLN crystal). Finally, the atomic state is read out via the interaction of another off-resonant Raman beam 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.

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

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