Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Electrometry and Quantum Memory With Rydberg Atoms DAVID MEYER, University of Maryland - College Park, KEVIN COX, FREDRIK FATEMI, PAUL KUNZ, U.S. Army Research Laboratory — Rydberg states of atoms with large principle quantum number n have extreme sensitivity to electric fields, with dipole moments that scale as n^2. These states are promising for applications in precision measurement of microwave electric fields and open new possibilities in quantum information science. First we present an experiment that uses thermal Rydberg atoms to measure amplitude-modulated (AM) RF fields. Amplitude modulation can improve state-of-the-art sensitivities already achieved using Rydberg atoms, and through AM we demonstrate a phase-shift-keying communication protocol. In addition, we present progress on a new experiment to trap laser-cooled Rydberg atoms in an optical cavity where the Rydberg blockade may allow a deterministic and high fidelity quantum memory for a high entanglement rate quantum repeater.

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Date submitted: 28 Jan 2017 Electronic form version 1.4