Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Rydberg atoms in a linear magnetic atom guide[1] MALLORY TRAXLER, RACHEL SAPIRO, University of Michigan, CORNELIUS HEMPEL, Institute for Quantum Optics and Quantum Information, Innsbruck, KARL LUNDQUIST, ERIK POWER, GEORG RAITHEL, University of Michigan — We study the trapping and guiding of Rydberg atoms in a high-gradient two-wire magnetic atom guide. Samples of several hundred cold $59D_{5/2}$ Rb Rydberg atoms are prepared at densities of order $2x10^8$ cm^{-3}. The atoms are ionized after a variable delay time using a microwave pulse. The resulting ions are imaged onto a position-sensitive microchannel plate detector, and time-domain multi-scaler traces as well as gated CCD images of the ion signals are obtained. We observe guiding of Rydberg atoms over a period of 5 ms following excitation. There is a brief initial period during which about 7% of the Rydberg atoms undergo Penning ionization. The decay time of the guided atom signal is about five times that of the initial state lifetime. We attribute the increase in lifetime to an initial phase of l-changing collisions concurrent with the Penning ionization phase and also to thermal electric-dipole transitions. A Monte Carlo simulation reproduces most experimental observations and offers insight into the internal-state dynamics.

[1]This work has been supported by the Army Research Office (50396-PH). MT acknowledges support by a NDSEG fellowship.

Mallory Traxler
University of Michigan

Date submitted: 26 Jan 2012 Electronic form version 1.4