Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

High-gradient Magnetic Guide for Rydberg Atoms R. MHASKAR, C. HEMPEL, M. TRAXLER, V. VAIDYA, G. RAITHEL — The theory of guided Rydberg atoms and one-dimensional systems of Rydberg atoms has attracted immense interest recently in context of spin chains and one dimensional quantum random walks. Here we describe an experimental setup to guide Rydberg atoms in a high-gradient magnetic trap and provide an outlook toward implementing traps for Rydberg atoms with a very large aspect ratio of 1:1000. The magnetic guide consists of a two-dimensional quadrupole field generated by two parallel wires carrying parallel currents, producing a magnetic-field gradient at the guide center of 2.7 kGauss-cm^{-1}. The magnetic guiding of cold, dense beams of ^{87}Rb atoms is described in [1]. In the guide, the atoms are subjected to a two-step excitation $5S_{1/2} \rightarrow 5P_{3/2} \rightarrow nD_{5/2}$ process, where n is the principal quantum number of the Rydberg state. For detection, the Rydberg atoms are field-ionized, and the ions are imaged onto a spatially resolving Multi-Channel Plate detector. Due to the high density of the guided atomic beam, the density of the Rydberg atoms is expected to be high, leading to state-mixing collisions. These will populate high angular momentum states having a large magnetic moment and long lifetimes. It is expected that a fraction of the atoms will become trapped and magnetically guided. **[1]** S. E. Olson, R. R. Mhaskar, and G. Raithel, *Phys. Rev. A* **73**, 033622 (2006).

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Date submitted: 04 Feb 2008 Electronic form version 1.4