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Guiding and Trapping of Rydberg atoms in a linear magnetic atom guide[1] CORNELIUS HEMPEL, MALLORY TRAXLER, VARUN VAIDYA, GEORG RAITHEL, Physics Department, University of Michigan — We describe an experimental approach and present results on the dynamics of Rydberg atoms in a high-gradient magnetic guiding and trapping apparatus. The setup consists of two parallel current-carrying wires providing a quadrupole trapping potential with a gradient of 2.7 kG·cm^{-1} at its center. A Ioffe-Pritchard type trap can be formed by superposition of an inhomogeneous longitudinal bias field. Rubidium Rydberg atoms are excited using the two-photon transition $5S_{1/2} \rightarrow 5P_{3/2} \rightarrow nL$, where n and L are principal and angular-momentum quantum numbers. An ion-imaging insert allows for time-delayed and spatially resolved detection of the excited atoms and their motion within the trapping potential. The excitation geometry is suitable for coherent, highly efficient population of circular Rydberg levels using adiabatic transfer in crossed magnetic and time-dependent electric fields. Circular-state atoms have long radiative lifetimes and small electric polarizabilities, making them ideal for Rydberg-atom trapping experiments and for studies that require long coherence times.

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