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Modeling Paths of Launched Cold Rydberg Atoms in a Cylindrically-Symmetric Electric Field ANNE GOODSELL, SASHA CLARICK, RENE GONZALEZ, Middlebury College — We calculate the trajectories of launched cold Rydberg atoms in a cylindrically-symmetric electric field as we prepare to steer cold Rydberg atoms in the field of a charged wire. We cool and launch rubidium atoms, and we have already excited launched atoms using the two-photon pathway $5S \rightarrow 5P \rightarrow 5D$ with resonant photons. We are preparing to excite the Rydberg states with $n = 35$, $|m_j| = 7/2$, from the $5D$ state. To predict the subsequent motion of atoms in Rydberg states we evaluate the acceleration derived from the spatially-dependent Stark shift. Atoms approaching the wire move through regions corresponding to positive and negative acceleration, dependent on the non-monotonic energy shifts. The atoms will be deflected by the wire; some are captured and intersect the wire surface (or another chosen boundary). Our iterative calculations of the atoms' dynamics indicate that atoms launched with a large impact parameter can still be captured. For atoms traveling at 6 m/s toward a wire charged to 3 V, the critical impact parameter for capture is 65 μm, leading to a capture cross-section more than four times the geometrical cross-section of the wire. We characterize the capture cross-section for velocities and voltages relevant to our planned experiments.

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