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Characterization of Launched Atoms Leading to Observations of Cold Rydberg Atoms in the Field of a Charged Wire ANNE GOODSELL, EMMA ERWIN, Middlebury College — We are preparing to accelerate and decelerate cold Rydberg atoms in the field of a charged wire. We cool and launch rubidium atoms and observe the distribution of atoms up to 16 mm above the trap location. We report a transverse speed less than 1/10 of the longitudinal launch speed. For Rydberg-atom observations, the cold cloud will be illuminated in mid-flight to promote atoms into the desired Rydberg state (e.g. n = 33-40). With a three-photon sequence we will access nf states and the nearby manifolds with linear Stark shifts. We observed the first two steps of this process using counter-propagating beams of 780 nm and 776 nm in a Rb cell. For cold Rydberg atoms, we will compare states that are strongly accelerated to states that are strongly decelerated by the field around the charged-wire target. We calculate that the displacement during the Rydberg lifetime (e.g. $n = 35$, $\tau = 30$ μs) will be 200-300 μm farther for extreme attracted states. Detection will occur by spatially-dependent field ionization. Observations of atoms with zero angular momentum around the wire can be extended to atoms with nonzero angular momentum and also to study dynamics of Rydberg atoms with a quadratic Stark shift, building on previous work with ground-state atoms.

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