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Measurements of the ion velocity distribution in an ultracold neutral plasma derived from a cold, dense Rydberg gas[1] SCOTT BERGESON, Brigham Young University, MARY LYON, Joint Quantum Institute and Department of Physics, University of Maryland — We report measurements of the ion velocity distribution in an ultracold neutral plasma derived from a dense, cold Rydberg gas in a MOT. The Rydberg atoms are excited using a resonant two-step excitation pathway with lasers of 4 ns duration. The plasma forms spontaneously and rapidly. The rms width of the ion velocity distribution is determined by measuring laser-induced fluorescence (LIF) of the ions. The measured excitation efficiency is compared with a Monte-Carlo wavefunction calculation, and significant differences are observed. We discuss the conditions for blockaded Rydberg excitation and the subsequent spatial ordering of Rydberg atom domains. While the blockade interaction is greater than the Rabi frequency in portions of the atomic sample, no evidence for spatial ordering is observed.

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