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Rydberg tagging time-of-flight imaging: An improved apparatus for studying many-body processes[1] JONATHAN TALLANT, DONALD BOOTH, ARNE SCHWETTMANN, JAMES SHAFFER, University of Oklahoma — With Rydberg tagging time-of-flight imaging of cold atoms, we have achieved a velocity resolution of $\sim$2.5 cm/s. The apparatus and resolution have already allowed us to observe ultralong-range electric field-induced Cs_2 molecules, and differentiate them from low-energy inelastic collisional processes. Addition of a Zeeman-slowed atomic beam and tapered amplifier system have given nearly two orders of magnitude increase in the number of atoms trapped in our MOT, making many-body processes, such as three-body recombination, much easier to detect. With the implementation of two crossed dipole trapping beams, the number density available in the trap has also increased by nearly two orders of magnitude. Data on $nS_{1/2}$+$6S_{1/2}$ Rydberg molecules and other ultracold collision processes will be presented.

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