Abstract Submitted
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Cold ion-neutral hybrid trap[1] DOUGLAS GOODMAN, JAMES WELLS, JONATHAN KWOLEK, Department of Physics, University of Connecticut, Storrs, CT 06269, FRANCESCO NARDUCCI, Naval Air Systems Command, EO Sensors Division, Bldg 2187, Suite 3190 Patuxent River, MD 20670, USA , WINTHROP SMITH, Department of Physics, University of Connecticut, Storrs, CT 06269 — Ultracold atomic physics is the study of matter at temperatures near absolute zero. Many new and exciting technologies such as atomic clocks and quantum computers are rooted in cold atomic and molecular research. Over the past decade there has been growing interest in studying simultaneously trapped and cooled atomic ions, molecular ions, and neutral atoms. A hybrid ion-neutral trap (pioneered at the University of Connecticut) uniquely combines two normally separate apparatuses. Our hybrid trap is made of a cold alkali magneto-optical trap (MOT) inside an ion Paul trap. The hybrid apparatus is ideal for studying ion-neutral collisions within the cold regime. We study neutral alkali atom collisions with atomic or molecular ions, because the large polarizability of the neutral alkali means that the collision cross sections are a million times larger than neutral-neutral cross sections. We will present some of our completed and proposed experiments, which include a general method for sympathetically cooling ions, and measurements of elastic and charge-exchange collision rates. Both experiments explore the controllability and manipulation of ion-neutral reactions. We will also report on our progress toward a model-independent determination of the MOT's excited state population.

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