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Measurements of ion-atom collision rates within a hybrid trap[1]
DOUGLAS GOODMAN, JAMES WELLS, University of Connecticut, FRANK NARDUCCI, Naval Air Systems Command, Bldg 2187, Suite 3190, WINTHROP SMITH, University of Connecticut — The realization of hybrid ion-neutral traps has increased experimental and theoretical interest in cold collisions between atomic or molecular ions and neutral atoms. Due to the polariziblity of the neutral alkali species, ion-atom collisions can have large elastic and charge-exchange scattering cross sections ($\sim 10^6$ a.u.) compared to neutral collisions (~ 1 a.u.). Experimental measurements of these collisions rates as a function of collision energy and the initial atomic states of the colliding partners are of great interest to astrophysics, quantum information, and theoretical atomic physics. The hybrid trap used by our group consists of a sodium (Na) MOT concentric with the center of a linear rf quadrupole ion trap containing sodium or calcium (Ca^+) ions. We present preliminary "dark" measurements of the total collision rate (both charge exchange and elastic) between Na^+ and Na, as well as measurements of the charge exchange rate between Ca^+ and Na.

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