

Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Quadrupling the strong coupling in ultracold neutral plasmas¹

MARY LYON, SCOTT BERGESON, Brigham Young University — Ultracold neutral plasmas provide fertile ground for investigating the properties of strongly coupled neutral systems. To this end, a priority in the field is to generate ultracold plasmas with higher values of the strong coupling parameter Γ , which is given by the ratio of the nearest neighbor Coulomb potential energy to the average kinetic energy of the ions. Simulations predict that exciting the plasma ions to higher ionization states can increase the strong coupling in an ultracold plasma by as much as a factor of 4. We describe an experiment in laser-cooled calcium in which laser pulses are used to singly ionize neutral atoms in a magneto-optical trap. A second set of laser pulses are used to produce Ca^{2+} . The maximum value of Γ depends on the time at which the second ionization pulse arrives. This talk will describe the experiment and recent results.

¹Funding provided by the National Science Foundation and the Air Force Office of Scientific Research

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Date submitted: 25 Jan 2013

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