Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

Sideband cooling for improved sympathetic heating spectroscopy
JAMES GOEDERS, School of Chemistry, Georgia Institute of Technology, CHARLES NICHOLS, School of Physics, Georgia Institute of Technology, KENNETH BROWN, School of Chemistry, Georgia Institute of Technology — Sympathetic Heating Spectroscopy (SHS), in which the laser-frequency dependent heating of an (spectroscopy) ion of interest is measured by observing the fluorescence of a second (control) ion as the system is re-cooled, may be used to detect weak spectral lines via atomic fluorescence. Low photon scattering rates from the spectroscopy ion can still create a significant stochastic optical force, Doppler shifting the resonance of the control ion in a way which can be observed during recooling. Previous work in our lab has demonstrated observable signals from scattering rates as low as 1500 photons/s. To observe transitions with still lower scattering rates, such as those present in molecular ions, the sensitivity of SHS must be improved. One method is to sideband cool the Coulomb crystal to the ground state and observe heating by measuring the relative heights of the first order secular motion sidebands. As a first step, sideband cooling of both ions must be demonstrated. This talk will discuss progress towards this goal of sympathetic ground state cooling.

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Date submitted: 28 Jan 2013 Electronic form version 1.4