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Sympathetic Heating Spectroscopy with atomic sideband measurement CRAIG CLARK, JAMES GOEDERS, GRAHAME VITTORINI, C. RICARDO VITERI, KENNETH BROWN, Georgia Institute of Technology — The idea of transferring information between multiple trapped atomic ions is a common and necessary practice in Quantum Information Processing (QIP). We have developed a technique which takes advantage of the Coulombic coupling used in QIP to acquire spectroscopic information of a trapped ion. Sympathetic Heating Spectroscopy (SHS) works through a two-step process in which we heat the two ion Coulombic crystal via the spectroscopy ion, and then obtain spectroscopic information by observing changes in fluorescence of the control ion as the system is recooled. We initially used two different isotopes of calcium in the incoherent regime of Doppler recooling, and are extending the method to look at a middle ground between SHS and Quantum Logic Spectroscopy (QLS) where atomic sidebands are used to determine the temperature. The main difference between QLS and the new method is that it is unnecessary to have coherent control of the spectroscopy ion. Measurements showing the improved sensitivity using atomic sidebands and preliminary results for replacing the atomic spectroscopy ion with a molecular ion will be presented.

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