Probing molecular ions with laser-cooled atomic ions

A/Prof Kenneth Brown
Georgia Institute of Technology, USA

Biography
Kenneth Brown is an Associate Professor in the Schools of Chemistry and Biochemistry; Computational Science and Engineering; and Physics at the Georgia Institute of Technology. He received his PhD from University of California, Berkeley studying theoretical issues in quantum information in the group of Birgitta Whaley. As a postdoctoral fellow at MIT, he worked on trapped ion and NMR quantum information experiments in the group of Isaac Chuang. His current research interests are cold molecular ions and quantum information.

Abstract
Laser-cooled atomic ions can be exquisitely controlled at the quantum level. As a result, trapped atomic ions have been used to build extremely precise atomic clocks, quantum simulators of magnetic materials, and prototype quantum computers. This control can also be used to sympathetically cool and probe co-trapped molecular ions. Current experiments with mixtures of molecular ions and laser-cooled atomic ions include the measurement of chemical rates at temperatures of a few Kelvin and precision spectroscopy of vibrational transitions.

My group is studying the limit of performing molecular spectroscopy with a single molecular ion and a single atomic ion. Precise measurement of molecular ion transitions has applications in both astrochemistry and the measurement of possible time variations in fundamental constants. I will present our work on determining the molecular ion mass by resolved atomic sideband spectroscopy and our progress towards measuring the vibrational overtones metal hydride ions.