SINGLE MOLECULAR ION SPECTROSCOPY: TOWARDS PRECISION MEASUREMENTS ON CaH⁺

KENNETH R BROWN, NCAMISO B KHANYILE, RENE RUGANGO, Department of Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta, GA, USA; GANG SHU, AARON CALVIN, Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta, United States.

Precision spectroscopy of molecular ions has applications in astrochemistry, quantum state controlled chemical reactions, and measurements of fundamental constants. While spectroscopy of molecular ions is challenging, we present techniques to study molecular ions co-trapped with laser-cooled atomic ions in ion traps. We recently demonstrated the measurement of the $\nu' = 10 \leftarrow \nu = 0$ and $\nu' = 9 \leftarrow \nu = 0$ overtone transitions in CaH⁺, using resonant two photon dissociation. This technique is extended to the $2^1 \Sigma \leftarrow 1^1 \Sigma$ electronic transition, which should be rotationally resolvable. This resolution will allow further investigation into the internal state control of CaH⁺ by techniques such as optical pumping, cryogenic cooling, and buffer gas cooling.