VIBRATIONAL SPECTROSCOPY OF GAS PHASE CATIONS BY INFRARED MULTIPHOTON DISSOCIATION IN AN FTICR MASS SPECTROMETER

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A 4.7 Tesla Fourier Transform Ion Cyclotron Resonance (FTICR) mass spectrometer has been installed at the Free Electron Laser for Infrared eXperiments (FELIX) in Nieuwegein, the Netherlands as part of a joint project between FOM Rijnhuizen, the University of Florida, and the National High Magnetic Field Laboratory (NHMFL). The objective of the project is to investigate the vibrational spectroscopy of ionic species by infrared multiphoton dissociation (IRMPD) using a free-electron laser as an infrared source. In the IRMPD technique, a molecule is ?heated? to above its fragmentation threshold by sequential, resonant absorption of many (10-100) infrared photons. Free electron lasers in general, and FELIX in particular, provide broad tuning ranges (5-250 μm) in the infrared, as well as high pulse energies (50 mJ/pulse), making them well suited as a tunable infrared source for IRMPD experiments.
In this talk the details of the experimental technique are presented, including a discussion of the FTICR apparatus and the FELIX laser. Some examples of experimental results are presented for a range of systems, highlighting the novel aspects of the IRMPD technique.