



SEMINAIRE ISMO

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Sub-Doppler spectroscopy of small molecular ions in the mid-infrared

Molecular ions play an important role in determining the chemistry and properties of low temperature plasmas, which span environments as diverse as interstellar molecular clouds, planetary ionospheres, and chemical reactors for materials processing. In addition, molecular ions are useful for probing fundamental physical phenomena such as the breakdown of the Born-Oppenheimer approximation or the electron electric-dipole moment. Astronomers and quantum chemists are in need of highly accurate and precise measurements of the rotational and vibrational structure of molecular ions, which can be provided by mid-infrared spectroscopy.

Measuring the infrared signals of molecular ions in the gas phase poses significant challenges. Even under ideal conditions, ions are generated in minuscule quantities and can be easily obscured by signals from the far more abundant neutral molecules. Here, we discuss the technique we have developed which is capable of overcoming these challenges by combining the sensitivity of cavity-enhanced methods with the ion-neutral discrimination of velocity modulation spectroscopy. This has proven to be an effective tool for measuring transition frequencies of molecular ions such as H_3^+ , HeH^+ , and OH^+ to within 0.0001 cm^{-1} when paired with the accuracy of an optical frequency comb. These measurements have provided valuable insight into the behavior of coupling between electronic and nuclear motion in H_3^+ , and have assisted in astronomical observations of OH^+ and HeH^+ .

Mardi 16 juillet 2019 à 11 h
Amphithéâtre du bât 520 (3^{ème} étage)
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