



Soutenance de thèse

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Cavity ring-down spectroscopy of astrophysically relevant molecular species, toward quantitative and high resolution studies using spectro-temporal properties of high finesse cavities

The main objective of this PhD was to develop spectroscopic techniques using high finesse optical cavities. These were applied to the measurement of quantitative spectroscopic data for neutral, radical and ionic molecular species of astrophysical interest in the near infrared and visible spectral range.

The first part was devoted to the measurement of the oscillator strength of high vibrational overtone bands of the cyanoacetylene (HC_3N) molecule with the Cavity Ring Down Spectroscopy (CRDS) technique.

The second part was devoted to the study of the spectroscopy of transient neutral and ionic species. For that, an inductively radio frequency (RF) discharged has been coupled to the CRDS set up. The pertinence of this plasma to efficiently produce anions was demonstrated via the quantitative measurement of the $\text{C}_2^- / \text{C}_2$ ratio in a wide variety of conditions. A quantitative spectral analysis of the radical isotopomers $^{14}\text{NH}_2$ and $^{15}\text{NH}_2$ was also performed for the first time. This study provides experimental data that will allow to better constraint the $^{15}\text{N}/^{14}\text{N}$ isotopic ratio in comets through the emission lines of these two amino bearing isotopomers.

The third and last part of the work was devoted to the development of a CRDS scheme called Broad Band Dual Etalon Frequency Comb Ring Down Spectroscopy. This new heterodyne technique, based on the use of the microsecond frequency combs generated by two high finesse optical cavities, should allow performing molecular spectroscopy with ultrahigh spectral resolution. First proof experiments were performed and perspective's for improvement of the method is provided.

Keywords : CRDS, HC_3N , RF discharge, C_2 , C_2^- , $^{15}\text{NH}_2$, frequency comb

Mardi 12 Juillet à 14h30

Bât 210 – Amphi 1 (2^{ème} étage)

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La soutenance sera suivie d'un pot auquel vous êtes chaleureusement conviés.