SUB-DOPPLER SPECTROSCOPY OF C_2H_2 BY NOISE-IMMUNE CAVITY-ENHANCED OPTICAL HETERODYNE MOLECULAR SPECTROSCOPY AROUND 1.4 μm

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An insight of sub-Doppler high-resolution lines of C_2H_2 in the Near-Infrared will be presented. Data have been obtained by using the very sensitive Noise-Immune Cavity-Enhanced Optical Heterodyne Molecular Spectroscopy (NICE-OHMS) technique. Combined with a Wavelength Modulation, this technique is theoretically optimum to measure weak absorption transitions at a very high accuracy when it is associated with an Optical Frequency Comb (OFC). Nevertheless, under saturation conditions (Lamb-dip), a full control of the experimental parameters is demanded. Indeed, lacks of control may be at the origin of data misinterpretation. Here, we anticipated to use C_2H_2 as a benchmarking system for the NICE-OHMS technique.

Preliminary results will be presented. They are typically based on the mastering of the two key parameters which are the sample pressure, and the impinging power of the electromagnetic field.

In the past, data obtained under saturated absorption conditions have demonstrated that the resonance profiles may be difficult to interpret. Indeed, a genuine data analysis cannot be obtained without an appropriate modeling that can be a source of difficulties when dealing with nonlinear spectroscopy. Actually, several sets of data obtained with different setups, and by different authors do not allow converging toward a universal/unique model. For example, the role of the Velocity Changing Collision at low pressure can be challenged.

We anticipate that such kind on analysis, associated with a relevant model can help studying the different collisional processes inherent to any bulk system, typically a low pressure.

Nonlinear behaviors, resonance shape, pressure broadening, pressure frequency shift and resonance amplitude/integral will be mainly discussed in the perspective of quantitative analyses.

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