

CHIRPED-PULSE MILLIMETER-WAVE SPECTROSCOPY OF ASTROPHYSICAL RADICALS IN A PULSE JET DISCHARGE EXPERIMENT

OLIVIA CHITARRA, BÉRENGER GANS, OLIVIER PIRALI, MARIE-ALINE MARTIN-DRUMEL, *Institut des Sciences Moléculaires d'Orsay, Université Paris Saclay, CNRS, Orsay, France.*

A decade ago, the advent of broadband chirped-pulse Fourier-transform microwave spectrometers revolutionized rotational spectroscopy in the centimeter-wave region [1]. Commercial solutions are available in the millimeter-wave region, and new molecular spectroscopy investigations can now be undertaken.

Motivated by the prospect of enabling new interstellar detections, we have developed a new set-up associating a broadband chirped-pulse Fourier-transform millimeter-wave (W-band) spectrometer and a supersonic jet chamber. Radicals are produced by an electric discharge in the high pressure part of the jet and reactive species are directly probed by the radiation at temperatures as low as few Kelvin.

Using different organic precursors such as acetonitrile (CH_3CN), methanol (CH_3OH) or allene (C_3H_4), we were able to study rich discharge mixtures. Among others, we were able to produce and detect the cyanomethyl radical (CH_2CN) [2], the methoxy radical (CH_3O) [3] and cyclopropenylidene ($c - \text{C}_3\text{H}_2$) [4] in the vibrational ground state and in several vibrational excited states. In the presentation, technical details of the set-up will be provided, together with the preliminary results we obtained.

[1] Brown, G. G et al., *Review of Scientific Instruments*, 79, 053103 (2008)

[2] Saito, S. and Yamamoto, S., *The Journal of Chemical Physics*, 107, 1732 (1997)

[3] Endo, Y. et al., *The Journal of Chemical Physics*, 81, 122-135 (1984)

[4] Thaddeus, P. et al., *The Astrophysical Journal*, 299, L63-L66 (1985)