HIGH RESOLUTION FOURIER TRANSFORM SPECTROSCOPY OF TRANSIENT SPECIES ON THE FAR INFRARED "AILES" BEAMLINE OF SOLEIL SYNCHROTRON.

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Numbers of transient species have already been identified in cold and hotter sources of the interstellar medium. In a context of extensive far infrared (FIR) astrophysical observations (Herschel, ALMA, SOFIA, ...), we developed several experiments to record high resolution spectra of transient species using the Bruker IFS 125 FT interferometer associated to the bright FIR continuum extracted by the "AILES" beamline of SOLEIL.

Despite physical limitations in the FIR, **emission spectroscopy** is an efficient technique to observe pure rotational transitions of excited molecules and radicals in that spectral range[b]. The emission from a radio frequency discharge is collected by a single off-axis parabolic mirror and focused onto the entrance iris of the FT. Due to the S/N ratio, gas temperature and pressure broadening, FIR spectra were recorded at 0.004 cm^{-1} resolution.

Absorption spectroscopy benefits at AILES from the strong brilliance of the synchrotron radiation allowing a large improvement in sensitivity. For this purpose, we developed a multipass absorption DC discharge cell to record spectra of transient species. A set of mirrors placed in a White-type arrangement allows an absorption path length of 24 meters. Thanks to the relatively long path length of the cell and the synchrotron radiation source, this absorption technique appears to be sensitive and allows the use of the highest resolution of the FT (R=0.001 cm^{-1}).

We will present the results obtained with those two complementary techniques on several molecules (H_2O, HCN and NH_3[c]) and radicals (OH, NH_2, C_3, CH) from the MIR to the FIR.

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[a] ALSO AT: SOLEIL SYNCHROTRON, AILES BEAMLINE, SAINT-AUBIN, FRANCE.

[b] O. Pirali, M. Vervloet *Chemical Physics Letters 423, 376-381 (2006)*

[c] S. Yu, J. C. Pearson, B. J. Drouin, K. Sung, O. Pirali, M. Vervloet, M. A. Martin-Drumel, C. P. Endres, T. Shiraishi, K. Kobayashi, and F. Matsushima *Journal of Chemical Physics 133, 174317 (2010)*