

Pure rotational spectroscopy of reactive species in the sub-millimeter spectral region at SOLEIL

Location: Synchrotron SOLEIL / AILES beamline

Researcher in charge of the Trainees: O. Pirali / M.A. Martin

Maximum number of Trainees: 3

Part of the research activities on the AILES beamline at SOLEIL concerns the recording of high resolution spectra in the far-infrared region ($10\text{-}600\text{ cm}^{-1}$ or $300\text{ GHz-}20\text{ THz}$) [1]. The commercial Fourier Transform interferometer coupled to the AILES beamline permits to achieve a 30 MHz ultimate spectral resolution and enables the investigation of the rotational structure of gas phase samples. Such accuracy in the determination of the line frequencies allows a direct comparison with astronomical observations; thus our team is interested mainly in the spectroscopic characterization of molecules relevant for astrophysics. The samples can be non-reactive neutral (often large) species (see Ref. [2]) or highly reactive radicals (see Ref. [3]) and ions [4].

Schedule expected:

We propose the trainees to participate in the recording of the submillimeter spectrum of the radical molecules C_3H_2 and its isotopic derivative C_3HD produced in a discharge cell (Fig. 1) and probed using the frequency multiplication chain installed on the AILES beamline of SOLEIL. Both molecules have already been detected in space using the pure rotation transitions in the millimeter range. It is important for astrophysics to provide an improved experimental dataset from lab measurements (in particular pure rotation transitions within vibrationally excited states).

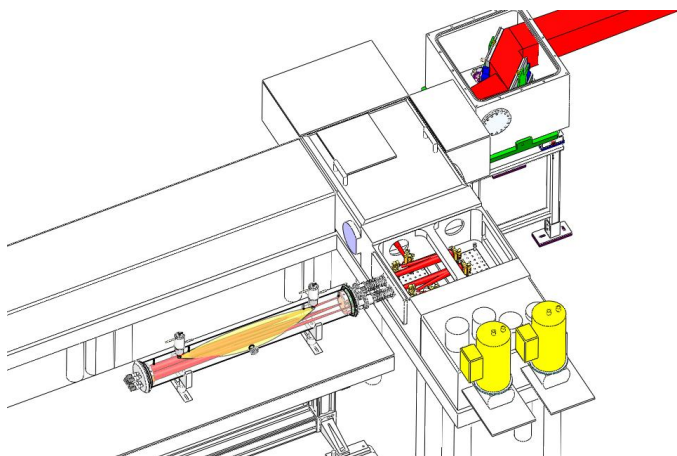


Fig.1 Schematic representation of the discharge cell associated to the FT interferometer of the AILES beamline.

- [1] <http://www.synchrotron-soleil.fr/portal/page/portal/Recherche/LignesLumiere/AILES>
- [2] Pirali, O., Boudon, V., Carrasco, N., & Dartois, E. , *Astronomy & Astrophysics*, 2014, 561: art.n° A109
- [3] Margulès, L., Martin-Drumel, M. A., Pirali, O., Bailleux, S., Wlodarczak, G., Roy, P., Roueff, E. and Gerin, M. *Astronomy & Astrophysics*, 2016, 591: art.n° A110.
- [4] Gruet, S., Morvan, A., Pirali, O., Chamaillé, T., Bouisset, E., & Vervloet, M. , *Canadian Journal of Physics*, 2013, 91(11): 937-940