The **25th** International Conference on

High Resolution Molecular Spectroscopy

Bilbao 2018 September 3rd–7th

Bizkaia Aretoa – UPV/EHU

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25th International Conference on High Resolution Molecular Spectroscopy – Abstract Book

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Varios Autores

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The nanocosmos gas Cell: A broadband Fourier transform millimeterwave spectrometer based on radio astronomy receivers

José Cernicharo[1], Francisco Beltrán[2], Celina Bermúdez[1], José Luis Domenech[3], Juan Daniel Gallego[2], Victor Herrero[3], Ramón Pelaez[3], Sandra I. Ramírez Jiménez[4], Isabel Tanarro[3]

1) *Molecular Astrophysics Group, Instituto de Física Fundamental (IFF), Consejo Superior de Investigaciones Científicas (CSIC)*
2) *Observatorio de Yebes (IGN), Centro Nacional de Tecnologías Radioastronómicas y Aplicaciones Geoespaciales (CNTRAG)*
3) *Molecular Physics Department, Instituto de Estructura de la Materia (IEM), Consejo Superior de Investigaciones Científicas (CSIC)*
4) *Laboratorio de Simulación de Ambientes Planetarios, Centro de Investigaciones Químicas, Universidad Autónoma del Estado de Morelos (UAEM)*

A Gas Cell reactor for the study of the chemical composition and evolution in different astronomical environments has been built as a part of the NANOCOSMOS project. It employs the same detection system as those present in radio-telescopes, constituting a novel and state-of-the-art approach to do rotational spectroscopy with kHz resolution. In particular, it has been implemented with Q-band (31.5-50 GHz) and W-band (72-116 GHz) receivers analogous to those built for the 40 meters telescope of Yebes Observatory (CNTRAG-IGN, Spain). These receivers are sensitive to the rotational emission of the molecules present in a one meter Gas Cell (no external polarization needed). The technique provides large instantaneous bandwidth, spectral purity, and a linear dependence of the signals with the partial pressure. Some pictures of the instrument are presented in Figure 1. The full description of the previous prototype cell can be found in *I. Tanarro, et al. A&A 2018.* In the initial experiments of the Gas Cell as a rotational spectrometer, we recorded the spectrum of CH_3CN in the Q and W-bands. After an integration time of 11 minutes, we could observe its vibrational excited states up to ~1000 cm^{-1} and its isotopologues in natural abundance, including ^{15}N with a spectral resolution of ~38 kHz and an estimated detection limit of 10^{-6} mbar.

The Gas Cell is also equipped with a quadrupole mass spectrometer, a UV-Visible spectrometer, a cold plasma generator (inductively coupled RF discharge) and UV-lamps. All these components make of the Gas Cell a versatile instrument that allows a full characterization of gas mixtures directly introduced in the chamber and also of the reaction products formed in cold plasmas or by UV radiation of the mixtures. In the present communication, we report the results of our investigation about the UV and plasma effects on several gas mixtures that mimic different scenarios such as the interstellar medium, the stratosphere of Titan (CH_4, N_2), or the prebiotic terrestrial atmosphere (CH_4, NH_3, H_2O).

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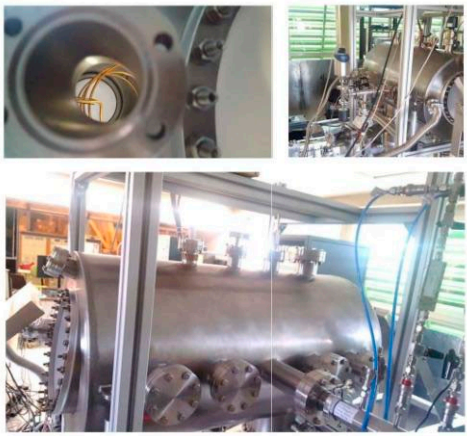
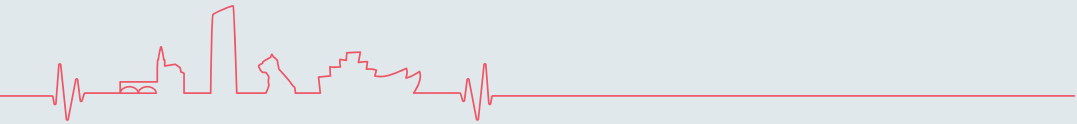


Figure 1: Pictures of Nanocosmos Gas Cell



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