

## DEVELOPMENT OF A MM-WAVE ULTRA-SENSITIVE SPECTROMETER FOR THE DETECTION OF SEMI-VOLATILE ORGANIC VAPORS

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Cavity-Enhanced Absorption Spectroscopy (CEAS) and Cavity Ring-Down Spectroscopy (CRDS) are well established for sensitive infrared measurements of gas phase compounds at trace level using their rovibrational signatures. The recent successful development of a THz Fabry-Perot spectrometer shows that the adaptation of such techniques to the THz and submillimeter is possible<sup>1</sup> by probing rotational transitions of light polar compounds. Here we report on the development of a new millimeter resonator based on a low-loss corrugated waveguide with highly reflective photonic mirrors obtaining a finesse above 3500 around 150 GHz. With an effective path length of one kilometer, a significant sensitivity has been evaluated by the measurement of line intensities as low as  $10^{-26} \text{cm}^{-1}/(\text{molecule}/\text{cm}^2)$ . This spectrometer will be used to detect semi-volatile organic vapors at trace level which could not be envisaged with a conventional detection technique.<sup>2,3</sup>

<sup>1</sup>Francis Hindle et al. *Optica*, vol.6, 1449-1454, (2019).

<sup>2</sup> Gaël Mouret et al. *IEEE Sensors*, vol.11(1), 133-138, (2013).

<sup>3</sup>Roucou et al., *CHEMPHYSICHEM*, 19, 1056-1067, (2018).

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