

## AN HETERODYNE SPECTROMETER FOR TERAHERTZ SPECTROSCOPY

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The Terahertz (THz) region of the electromagnetic spectrum between the infrared to the microwave domains (0.1 – 10 THz) is often referred to as the “THz gap”. Nevertheless, it has become widely accessible over the last decades by different sources, particularly with multiplication chains. In this context, the HEROES consortium has developed a heterodyne spectrometer based on a far-infrared (FIR) molecular laser pumped by a mid-infrared (MIR) quantum cascade laser (QCL) to address this spectral domain <sup>a,b</sup>. We present here a laboratory setup mixing on a hot electron bolometer (HEB) the FIR emission from the QCL-pumped molecular laser with a blackbody radiation transmitted by an single-path cell filled with a few  $\mu\text{bar}$  of the gaz under investigation. This setup enables to perform high resolution spectroscopy of rotational transitions of small molecules between 1 THz and 3.37 THz with a 5 GHz bandwidth and 80 kHz resolution. We will demonstrate these performances through absorption spectra of methanol at 1 THz and 2 THz along with emission spectra against a cold bakground of methanol and CD<sub>3</sub>OD.

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<sup>a</sup>Lampin, J.-F. et al. Opt. Lett. (2019) 44, 20

<sup>b</sup>Pagies, A. et al. APL Photonics (2016) 1, 031302