

W BAND CHIRPED-PULSE: THE BEAUTY OF COHERENT SPECTROSCOPY

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We built a chirped-pulse Fourier transform millimeter-wave spectrometer (CPFTS) [1], which is operational between 75 and 110 GHz. The design and operation of the instrument (excitation, optical path and detection scheme) will be discussed. The detector is based on a heterodyne receiver of an emission spectrometer [2] which we built and used before to sensitively record rotational spectra of complex molecules. The performance of the CPFTS instrument is analysed by recording spectra of methyl cyanide as well as products from a DC discharge of this molecule. Based on the quantitative calibration of the detector we compare the operation of the instrument as CPFTS with that of the emission spectrometer. We find molecular signals much higher in intensity and much lower in noise for the CPFTS operation. We demonstrate how the detection of the coherent molecular signal (FID) reduces the noise more efficiently compared to the detection of the emitted power when operating the system as an emission spectrometer.

References

[1] M. Hermanns, N. Wehres, B. Heyne, C. E. Honingh, U. U. Graf and S. Schlemmer, in preparation

[2] N. Wehres, B. Heyne, F. Lewen, M. Hermanns, B. Schmidt, C. Endres, U. U. Graf, D. R. Higgins and S. Schlemmer, IAU Symposium, 2018, pp. 332-345