

TWO INSTRUMENTS IN ONE: A NEW CP-FTMW EXPERIMENTAL SETUP TO MEASURE MULTIPLE FREQUENCY BANDS SIMULTANEOUSLY

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The introduction by Pate and coworkers^a of broadband capabilities in rotational spectrometers revolutionized the field and widened the scope of applications of rotational spectroscopy.^b Since its introduction, many different experimental setups have been reported depending on the end application. In most cases, the bandwidth is restricted to that of commercially available electronic components (mainly high-power amplifiers). The most common setups operate, thus, in limited bands of 2-8, 8-18, 18-26GHz, etc., and the collection in different bands entails the recording of the spectrum several times with the consequent increase in time and sample consumption. Here we present a new experimental approach that allows for the collection of two of those otherwise separate bands in a single measurement, which reduces the time and sample consumption by half. We use two dual-polarization broadband horn antennae to simultaneously polarize the molecular sample in the 2-8 GHz (horizontal polarization) and 8-12 GHz (vertical polarization). The molecular emission is then combined and directly collected on a fast oscilloscope as in a traditional broadband experiment. We will show the performance of this setup compared to separated measurements, which allows for a faster collection of the whole frequency range without compromising the sensitivity. This approach only requires minimal modifications to the current spectrometers.

^aBrown, G. G.; Dian, B. C.; Douglass, K. O.; Geyer, S. M.; Shipman, S. T.; Pate, B. H. A Broadband Fourier Transform Microwave Spectrometer Based on Chirped Pulse Excitation. *Rev. Sci. Instrum.* **2008**, 79 (5), 053103. <https://doi.org/10.1063/1.2919120>.

^bPark, G. B.; Field, R. W. Perspective: The First Ten Years of Broadband Chirped Pulse Fourier Transform Microwave Spectroscopy. *J. Chem. Phys.* **2016**, 144 (20), 200901. <https://doi.org/10.1063/1.4952762>.