BROADBAND MICROWAVE SPECTROSCOPY OF LARGE MOLECULES

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The rotational spectra of large molecules and their complexes have transitions that are dense and spread over a wide range of the microwave region of the electromagnetic spectrum, thus making their investigation with cavity-based rotational spectrometers very time-consuming and tedious. Recent developments now allow broadband microwave spectrometers to record wide portions of the rotational spectrum within a single, 100 μs measurement.[a] We have constructed a broadband rotational spectrometer covering the 2-8 GHz frequency region, a range particularly well suited to obtain the spectra of large and more complex molecules with large moments of inertia and thus small rotational constants. These spectra, aided by theory, offer detailed insights about the molecular geometry, conformational preferences, hyperfine structure, internal rotation, and, in combination with IR excitation, conformational isomerization reactions. Here we present the characterization and performance of our spectrometer and report the initial results of selected molecules.

[a] G. G. Brown, B. C. Dian, K. O. Douglass, S. M. Geyer, S. T. Shipman, and B. H. Pate *Rev. Sci. Instr.* **79**(5), 053103 2008.