A NOVEL DESIGN MOLECULAR BEAM FOURIER TRANSFORM MICROWAVE SPECTROMETER IN THE FREQUENCY RANGE 1 TO 4 GHZ

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During the recent years the growing interest on heavy van der Waals complexes generates an increasing need for a spectrometer covering frequency ranges suitable for complexes with large moments of inertia. We report on a new design for a Fourier transform microwave spectrometer in the spectral region 1 to 4 GHz, especially constructed for the investigation of rotational spectra of heavy van der Waals complexes. The molecular beam microwave spectrometers used so far are based on the prototype introduced by Balle and Flygare[a]. In contrast to these molecular beam spectrometers, employing a Fabry-Perot resonator working with TEM_{00q}-modes, the proposed design employs a different type of resonator operating with TE_{01q}-modes. This resonator allows for compact dimensions even at cut-off wavelengths above 0.1 m, i.e. cut-off frequencies below 3 GHz. The already fully automated spectrometer also features a coaxially oriented beam resonator arrangement, as recently introduced for Fabry-Perot resonator spectrometers[b]. Details of the design, performance data and example spectra of stable molecules and complexes are given.

[a] T.J. Balle and W.H. Flygare, Rev.Sci.Instrum. 52, 33(1981).
[b] J.-U. Grabow and W. Stahl, Z.Naturforsch. 45a, 1043(1990).