MICROWAVE STUDIES OF SOME MONO-SUBSTITUTED NAPHTHALENES TO AID IN ACCURACY AND PRECISION EVALUATIONS FOR A NEW HIGH RESOLUTION UV LASER SPECTROMETER

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The 1- and 2-methylnaphthalenes are revisited in the microwave region in order to evaluate both systematic and random errors associated with prior high-resolution measurements made in the ultraviolet.[a] The microwave data are obtained using an FTMW machine with absolute measurement accuracy of < 500 Hz traced to NIST reference standards. RMS standard deviations of the fits of the microwave data for the A- and E-line methyl torsional levels are < 3 kHz. While both UV and MW spectrometers have about the same resolving power, the higher accuracy of the FTMW instrument provides a solid framework to evaluate measurement errors in the determinations of the ground and electronically excited state rotational constants and torsional state barriers that were obtained from the fits of the UV data having RMS standard deviations of < 3 MHz. Similar comparisons will be made for other mono-substituted naphthalenes. New design concepts for calibration and detection will be addressed that should improve upon both the accuracy and precision of spectral data obtained from existing UV laser spectrometers and from a new instrument being constructed at NIST.

[a] X.-Q. Tan, W.A. Majewski, D.F. Plusquellic, D.W. Pratt, *J. Chem. Phys.*, **94**, 7721 (1991)