THE USE OF THE MOLECULAR BEAM ELECTRIC RESONANCE TECHNIQUE FOR HIGH PRECISION HYPERFINE MEASUREMENTS

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The molecular beam electric resonance technique, invented over a half century ago, remains the most accurate method of measuring molecular hyperfine interactions. When combined with recently developed techniques for computer control and data analysis, it can achieve uncertainties of less than 1 Hz for transitions in the tens of MHz range. For the heavier diatomic molecules, including the KI of our current investigation, it is necessary to use signal averaging times of several days in order to reduce the noise sufficiently. This is possible only with the use of software that can eliminate bad data points due to vacuum pressure bursts. Modern computer technology has also made it possible to quantitatively fit the detailed lineshape of the beam transitions, including the deconvolution of overlapping lines.