THE USE OF MOLECULAR BEAM SPECTROSCOPY TO MEASURE HYPERFINE INTERACTIONS

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New data using the electric resonance molecular beam spectrometer at St. Olaf College, along with refined methods of analysis, are revealing precise information about more molecules. Pure hyperfine transitions, which involve changes in energy resulting from turning the nuclear spins, are produced by an oscillating electric field. With linewidths on the order of 100 Hz and detailed fitting of the lineshape, it is possible to measure transition frequencies to a precision on the order of 1 Hz. By obtaining transition frequencies up to tens of megahertz, we can achieve as many as 8 significant figures in the measurements. The talk will review the operation of the spectrometer and the nature of the information obtained, including some puzzling shifts in the interactions for one nucleus when the isotope of the other is changed.