

BUFFER GAS COOLED MOLECULE SOURCE FOR CPMMW SPECTROSCOPY

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We have built a new molecular beam source that implements 20 K Neon buffer gas cooling for the study of the spectra of small molecules. In particular, laser ablation of BaF₂ pellets has been optimized to produce a molecular beam of BaF with a number density more than 100 times greater than what we have previously obtained from a typical Smalley-type photoablation supersonic beam source. Moreover, the forward beam velocity of 150 m/s in our apparatus represents an approximate 10-fold reduction, improving spectroscopic resolution from 500 kHz to better than 50 kHz at 100 GHz in a chirped-pulse millimeter-wave experiment in which resolution is limited by Doppler broadening. Novel improvements in our buffer gas source and advantages for CPmmW spectroscopy studies will be discussed. We thank David Patterson, John Barry, John Doyle, and David DeMille for help in the design of our source.