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Decelerating and Trapping Larger Polar Molecules DAVID PATTERSON, Harvard — Manipulating the motion of larger polyatomic molecules presents significant challenges compared to manipulation of diatomic molecules. In particular, extending Stark deceleration and electrostatic trapping to such species remains challenging. Although molecules as large as CH3F have been trapped and cooled, no general technique for trapping such molecules has been demonstrated, and cold molecules larger than 5 atoms have not been trapped. The combination of recently demonstrated continuous, high flux, slow, cold, buffer gas cooled beams of closed-shell volatile molecules, and a novel "asymmetric stretched state" Stark decelerator (proposed here), promise to realize a general system for decelerating and trapping samples of a broad range of volatile neutral polar prolate asymmetric top molecules; the technique is applicable to most stable molecules in the 100-500 AMU range. The trapped samples would initially be in a single rotational state, at a motional temperature of 100s of mK. Such samples would immediately allow for spectroscopy of unprecedented resolution, and straightforward extensions would allow for further cooling, direct observation of slow intra-molecular processes such as vibrational relaxation and Hz-level tunneling dynamics. Further applications include high precision tests of fundamental symmetries, such as searches for nuclear or electronic permanent electric dipole moments and predicted but not yet observed CP violation in spectra of chiral molecules. A proposed experimental design to realize trapped samples of Benzonitrile and Aminobenzonitrile is presented

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