Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Prospects for cavity-assisted laser cooling of OH[1] BENJAMIN LEV, BRIAN SAWYER, JOSH DUNN, CHRIS GREENE, JUN YE, JILA/NIST/U. of Colorado — The experimental realization of large samples of ultracold, ground state polar molecules would be a major breakthrough for research in ultracold collisions and chemistry, quantum information processing, and the study of novel states of matter. While many techniques for ultracold, ground state polar molecule production show promise, none so far have simultaneously yielded the low temperatures and high densities required to pursue these goals. The Stark decelerator provides a nice compromise between density and temperature. Electric and magnetic trapping of samples as cold as 10 mK at densities approaching $10^7/\mathrm{cm}^3$ have been demonstrated. However, new cooling techniques are required if we hope to push well below the 1 mK regime. Unlike atoms, molecules typically have an enormous number of channels into which a given excited state can decay. This makes the efficient free-space laser cooling of molecules challenging. Cavity-assisted laser cooling is a promising solution in that it provides dissipative cooling largely independent of molecular structure. We discuss attainable cooling rates and suppression of deleterious Raman scattering given current experimental constraints on cavity design and the number of intracavity molecules obtainable from our OH Stark decelerator.

[1]We acknowledge financial support from DOE, NRC, NSF, and NIST

Benjamin Lev
JILA/NIST

Date submitted: 01 Feb 2007

Electronic form version 1.4