Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Direct laser cooling of the BH molecule DARREN HOLLAND, STEFAN TRUPPE, RICHARD HENDRICKS, BEN SAUER, MICHAEL TARBUTT, Imperial College London — Ultracold polar molecules are of interest for a variety of applications, including tests of fundamental physics, ultracold chemistry, and simulation of many-body quantum systems. The laser cooling techniques that have been so successful in producing ultracold atoms are difficult to apply to molecules. Recently however, laser cooling has been applied successfully to a few molecular species, and a magneto-optical trap of SrF molecules has now been demonstrated. We have investigated the BH molecule as a candidate for laser cooling. We have produced a molecular beam of BH and have measured the branching ratios for the excited electronic state, $A^1\Pi(v'=0)$, to decay to the various vibrational states of the ground electronic state, $X^1\Sigma$. We verify that the branching ratio for the spin-forbidden transition to an intermediate triplet state is inconsequentially small. We measure the frequency of the lowest rotational transition of the X state, and the hyperfine structure in the relevant levels of both the X and A states, and determine the nuclear electric quadrupole and magnetic dipole coupling constants. Our results show that a relatively simple laser cooling scheme can be used to cool, slow and trap BH molecules.

Darren Holland
Imperial College London

Date submitted: 12 Nov 2014 Electronic form version 1.4