Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Progress Towards a Magneto-Optical Trap of Polyatomic Molecules NATHANIEL VILAS, LOUIS BAUM, CHRISTIAN HALLAS, DEBAYAN MITRA, JOHN DOYLE, Harvard University — Recent advances in laser cooling and quantum state control of diatomic molecules have made available new experimental platforms for the study of topics ranging from ultra-cold chemistry to quantum simulation of strongly correlated systems. In polyatomic molecules, the complex vibrational and rotational structure generically gives rise to closely spaced opposite parity levels in excited rotational states (for symmetric top molecules) or vibrational bending modes (for linear triatomic molecules). These parity doublets allow full polarization at low electric fields, a significant advantage for precision measurement [1], quantum computation [2], and quantum simulation [3]. Motivated by the promise of these novel systems, we report on progress towards a magneto-optical trap (MOT) of triatomic CaOH molecules. Our apparatus includes a buffer-gas cooling stage followed by 2D magneto-optical compression, laser slowing, and ultimately, trapping in a 3D MOT. The cloud of sub-milliKelvin CaOH molecules achievable in such a MOT will represent a good starting point for loading optical lattices or tweezer arrays for applications in quantum simulation and computation.
[1] Kozyryev and Hutzler, PRL 119, 133002 (2017). [2] Yu et. al, in preparation. [3] Wall et. al, New J. Phys. 17, 025001 (2015).

Nathaniel Vilas
Harvard University

Date submitted: 29 Jan 2019 Electronic form version 1.4