Abstract Submitted
for the APR21 Meeting of
The American Physical Society

Toward Ultracold Polyatomic Molecules for Measuring the Electron's Electric Dipole Moment BENJAMIN AUGENBRAUN, ZACK LASNER, ALEXANDER FRENETT, HIROMITSU SAWAOKA, ABDULLAH NASIR, JOHN DOYLE, Harvard University — Trapped ultracold molecules are a potentially powerful platform for probing physics beyond the Standard Model. YbOH, which has recently been laser cooled in one dimension to $<$600 μK, is predicted to have high sensitivity to the electron's electric dipole moment. Here, we report on work aiming to achieve laser cooling and trapping of large numbers of molecules in three dimensions. We have constructed a He-3-based cryogenic beam source with the goal of achieving forward velocities below 30 m/s and a superconducting Zeeman-Sisyphus decelerator designed to slow molecules to trappable velocities using just three photon scatters. To increase the number of molecules that could be trapped, we use a laser-assisted chemical reaction between Yb and H_2O to enhance molecular beam flux by more than an order of magnitude. We also present ultra-high-sensitivity measurements of vibrational branching ratios in YbOH, identifying vibrational states relevant for laser cooling using up to scattered 10^5 photons. From these measurements, we determine a feasible laser cooling scheme to achieve temperatures below the Doppler limit.

Benjamin Augenbraun
Harvard University

Date submitted: 07 Jan 2021 Electronic form version 1.4