Abstract Submitted
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Towards Laser-Cooled Polyatomic Molecules for Electron EDM Measurements[1] BENJAMIN AUGENBRAUN, ZACK LASNER, ALEXANDER FRENETT, HIROMITSU SAWAOKA, CALDER MILLER, PHELAN YU, Harvard-MIT Center for Ultracold Atoms and Department of Physics, Harvard University, TIMOTHY STEIMLE, School of Molecular Sciences, Arizona State University, JOHN DOYLE, Harvard-MIT Center for Ultracold Atoms and Department of Physics, Harvard University — Trapped ultracold molecules are a potentially powerful platform for probing time-reversal-symmetry violating effects beyond the Standard Model, such as the electron electric dipole moment. However, laser-coolable diatomic molecules lack the parity doublet structure useful for suppressing key systematic errors. Certain polyatomic molecules simultaneously possess the desired parity doublet *and* an electronic structure that allows for laser cooling. Thus a large, generic class of such species combines internal co-magnetometers, the ability to trap large numbers for long times, and large effective electric fields that enhance the signature of time-reversal-violating effects. We present progress toward laser cooling and trapping of Yb-containing polyatomic molecules. A slow cryogenic buffer-gas beam of YbOH is characterized and work toward photon cycling in YbOH is presented. We also describe a novel magnetic decelerator for slowing molecular beams to near the capture velocity of 3D magneto-optical traps without scattering photons. In addition, we present observations of the EDM-sensitive symmetric top molecule $YbOCH_3$. The measured Franck-Condon factors indicate that $YbOCH_3$ is also amenable to laser cooling, as expected from theory, and a laser cooling scheme is presented.

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