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Searches for Physics Beyond Standard Model Using Polyatomic Molecules[1] YI ZENG, NICKOLAS PILGRAM, ARIAN JADBABAIE, Caltech, SVETLANA KOTOCHIGOVA, JACEK KLOS, Temple University, TIMOTHY STEIMLE, Arizona State University, NICHOLAS HUTZLER, Caltech — Polar molecules are a robust platform for precision measurement searches of Charge-Parity (CP) violating physics beyond the Standard Model (BSM). Recent experiments on diatomic molecules have excluded BSM CP-violating leptonic physics at TeV energy scales. To further extend this range, it is desirable to combine advances in molecule laser cooling and trapping with these sensitive searches. However, diatomic molecules either do not have electronic structures amenable to optical cycling, or do not have innate strong systematic error rejection critical for these searches. Fortunately, certain polyatomic molecules have been identified to exhibit both laser-cooling capability and co-magnetometer states for error rejection, making them ideal candidates for advanced BSM searches. We report progress on two precision measurement experiments: a beam measurement probing hadronic CP violation via the magnetic quadrupole moment of the 173Yb nucleus using 173YbOH, and a measurement of laser-cooled and trapped 174YbOH to probe the electron EDM to search for new physics at the PeV scale. Recent advances include enhancement of molecule production by an order of magnitude, and spectroscopic studies of important energy levels of YbOH.

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