Abstract Submitted
for the APR21 Meeting of
The American Physical Society

Searches for New Fundamental Physics with Polyatomic Molecules NICHOLAS HUTZLER, Caltech — Polar molecules are highly sensitive to a wide variety of fundamental symmetry violations in the leptonic and hadronic sectors, and are currently the most sensitive probes of the electron EDM. However, many advantages of molecules are yet to be realized, including the application of advanced quantum control methods, and extending symmetry violation searches beyond the electron EDM, both of which offer the ability to extend the reach of experiments by orders of magnitude – far beyond the reach of direct searches. In this talk, we discuss how polyatomic molecules offer unique advantages for a variety of symmetry violation searches, including the electron EDM, nuclear magnetic quadrupole moments, and nuclear Schiff moments. The unique, symmetry-lowering mechanical modes of polyatomic molecules makes them highly polarizable and amenable to techniques for robust rejection of systematic effects. As these mechanical modes do not rely strongly on electronic structure, these advantages can be realized in a wide variety of nuclei with few restrictions. We will give updates on experimental and theoretical efforts in our lab to search for these symmetry violations, and to identify new molecules and methods for sensitive measurements of many sources of new fundamental physics.

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Date submitted: 07 Jan 2021 Electronic form version 1.4