

APR07-2007-000307

Abstract for an Invited Paper  
for the APR07 Meeting of  
the American Physical Society

**Francis M. Pipkin Award: Diatomic molecules: a powerful new tool for tests of fundamental physics<sup>1</sup>**

DAVID DEMILLE, Yale University

The complex energy level structure of molecules can be employed to dramatically enhance certain symmetry-violating effects. Our group is developing new techniques for controlling the quantum degrees of freedom (both internal and external) of diatomic molecules, in order to take advantage of these enhancements. Our experiments using molecules explore three different areas of fundamental interest in physics. The first of these is a search for the electron's electric dipole moment, a time-reversal violating effect predicted to appear at an observable level in most extensions to the Standard Model. The second is an improved measurement of the neutral electroweak vector electronic-axial hadronic coupling, complementary to previous and planned deep inelastic scattering measurements. The third is a high-sensitivity search for the possible temporal variation of a fundamental constant of nature, the electron-to-proton mass ratio. This talk will highlight our progress on, and future vision for, these experiments.

<sup>1</sup>Supported by NSF