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Nuclear Spin-Dependent Parity Violation in Diatomic Molecules<sup>1</sup> SIDNEY CAHN, DAVID RAHMLOW, MATTHEW STEINECKER, JEFFREY AMMON, EMIL KIRILOV, Yale University, EDWARD DEVENEY, Bridgewater State University, RICHARD PAOLINO, United States Coast Guard Academy, DAVID DEMILLE, Yale University — Nuclear spin-dependent parity nonconservation (NSD-PNC) effects arise from exchange of the  $Z^0$  boson (parameterized by the electroweak coupling constants  $C_{2\{P,N\}}$ ) between electrons and the nucleus and from the interaction of electrons with the nuclear anapole moment, a parity-odd magnetic moment. The latter scales with the nucleon number A of the nucleus as  $A^{\frac{2}{3}}$ , while the  $Z^0$  coupling is independent of A; the former will be the dominant source of NSD-PNC in nuclei with  $A \ge 20$ . The most precise result on NSD-PNC to date comes from a measurement of the hyperfine dependence of atomic PNC in <sup>133</sup>Cs, but this effect can be dramatically enhanced in diatomic molecules by bringing two levels of opposite parity close to degeneracy in a strong magnetic field. Level crossings have been observed in  $^{138}BaF$  as a precursor to the test for parity violation in <sup>137</sup>BaF. We report on our measurements and planned design improvements to improve sensitivity in preparation for the parity violation experiment.

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