SPECTROSCOPY IN SUPPORT OF PARITY NONCONSERVATION MEASURMENTS: THE $A^2\Pi - X^2\Sigma^+$ (0,0) BAND OF BARIUM MONFLUORIDE

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There is renewed interest in the spectroscopy of heavy metal containing polar radical diatomic molecules because they provide a sensitive venue for detection of parity nonconservation (PNC) either from the determination of the electric dipole moment (EDM) [a] of the electron, d_e, or detection of the interaction of the anapole moment of the nuclei with the unpaired electron [b]. The effects due to d_e are nuclear spin independent and studies of both the even and odd nuclear spin isotopologues are relevant. Recently, DeMille *et al* proposed using an odd isotopologue of barium monofluoride, ^{137}BaF, to measure the nuclear spin-dependent parity non-conservation (NSD-PNC) effect resulting from the interaction of the anapole moment of ^{137}Ba with the unpaired electron of the $X^2\Sigma^+$ electronic state. Here we report on the analysis of the field-free spectrum of the $A^2\Pi - X^2\Sigma^+$(0,0) band of ^{137}BaF and an analysis of the $^{137}Ba(I = 3/2)$ and $^{19}F(I = 1/2)$ hyperfine interaction in the $A^2\Pi$ state. The hyperfine interaction in the $X^2\Sigma^+$ state has been previously characterized from the analysis of the pure rotation spectrum.[c] The optimal optical transitions for monitoring ^{137}BaF in future PNC measurements will be discussed.

[a] M. G. Kozlov, A. V. Titov, N. S. Mosyagin, and P. V. Souchko, *Phys. Rev. A: At., Mol., and Opt. Phys.* **56** R3326, 1997.
[b] D. DeMille, S. B.Cahn, D.Murphree, D. A. Rahmlow, and M. G.Kozlov *Phys. Rev. Letts.* **100** 023003, 2008.
[c] Ch. Ryzlewicz, H-.U.Schutze-Pahlmann, J. Hoeft and T. Torring, *Chem.Phys.* **71** 389, 1982.