CALCULATION OF P- AND P, T-ODD EFFECTS IN HgF AND PbF

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A number of atomic experiments were made in order to measure the electric dipole moment (EDM) of the electron. But it is known that enhancement coefficient for the electron EDM is much larger in heavy diatomic radicals [1,2]. However, corresponding molecular calculations are rather difficult. The main problem arises from the necessity to evaluate matrix elements that depend on the molecular wave function in the vicinity of the nucleus, where relativistic effects are not small, and usual approximations are not valid.

An algorithm for the calculation of the wave function in the vicinity of the nucleus is suggested and enhancement coefficients for HgF and PbF radicals are calculated [3]. To estimate the accuracy of the result, several molecular constants sensitive to the relativistic corrections (the hyperfine structure tensor, the constant of ω-doubling and g-factors) were calculated. Comparison with the experimental data showed that the accuracy is about 15—20%. It is enough to obtain reliable information on the electron EDM from molecular experiment. On the other hand, this calculation confirms that HgF radical is the best radical for the EDM experiment.

For the same molecules contributions of the P- and P,T-odd interactions to the effective spin-rotational Hamiltonian were also calculated. The latter was used in [4] to show that in the magnetic field one can observe a number of P-odd effects caused by the anapole moments of the Hg or Pb nuclei.

References

1. *Sushkov O.P., Flambaum V.V. //Zh.Eksp.Teor.Fiz., 1978. V.75. P.1208.*
2. *Gorshkov V.G., Labzovsky L.N., Moskalev A.N. //Zh.Eksp.Teor.Fiz., 1979. V.76. P.414.*
3. *Dmitriev Yu.Yu. et al. Preprint LNPI-1686. Leningrad. 1991. 13 p.*
4. *Labzovsky L.N., Kozlov M.G., Mitrushenkov A.O. //Zn.Eksp.Teor.Fiz., 1991. V.100. P.749.*