Abstract Submitted
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Development of new methods of calculation for complicated atoms: application to parity violation in Pb[1] SERGEY PORSEV, MARIANNA SAFRONOVA, University of Delaware — Measurements of parity nonconserving (PNC) optical rotation in the vicinity of the $6p^2\,{}^3P_0 - 6p^2\,{}^3P_1$ magnetic dipole transition in atomic Pb were carried out almost 20 years ago by Meekhof et. al., [1] and by Phipp et. al., [2] giving the ratios of the PNC E1 amplitude to the M1 amplitude, R, to be $(-9.86 \pm 0.12) \times 10^{-8}$ [1] and $(-9.80 \pm 0.33) \times 10^{-8}$ [2]. Due to the complicated electronic structure of Pb, the best calculation of the quantity R was estimated to have 8% uncertainty [3]. We have developed a new method of calculation based on the combination of configuration interaction and coupled cluster approach that can use different Hartree-Fock potentials as a starting point. We applied it to the calculation of Pb atomic properties, including energy levels, hyperfine structure constants, and E1 transition amplitudes. Many of the properties were calculated for the first time. We also determined the PNC E1 $6p^2\,{}^3P_0 - 6p^2\,{}^3P_1$ transition amplitude. An analysis of the results and uncertainties is underway. Final results will be reported at the conference.

[1] D.M. Meekhof et. al, PRL 71, 3442 (1993).
[2] S.J. Phipp et. al., J. Phys. B 29, 1861 (1996).
[3] V.A. Dzuba et. al., Europhys. Lett. 7, 413 (1988).

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