Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Nuclear spin-dependent parity violation in Cs and Fr[1] MARIANNA SAFRONOVA, University of Delaware — The study of parity nonconservation (PNC) in cesium led to a first measurement of the nuclear anapole moment and allowed to place constraints on weak meson-nucleon couplings. These constraints were found to be in disagreement with the ones obtained from nuclear parity violating experiments. The discrepancy of the nuclear and atomic PNC studies motivated further investigation of Cs spin-depended PNC amplitude. The Fr experimental work is in progress at TRIUMF [Sheng et al., J. Phys. B 43, 074004 (2010)] and theoretical calculations are needed for future interpretation of the results. In this work, we carried out high-precision relativistic all-order calculations of the spin-dependent PNC amplitudes in the $6s-7s$ transition in Cs and the $7s-8s$ transition in Fr using relativistic all-order methods in which all single, double, and partial triple excitations of the Dirac-Fock wave functions are included to all orders of perturbation theory. The new Cs all-order result was found to be consistent with the older atomic physics value of the anapole coupling constant. The nuclear spin-dependent PNC amplitudes between the hyperfine structure components of the ground state of Fr are also evaluated. The dependence of the results on the values of nuclear parameters is investigated.

[1]This work was supported by the NSF.

Marianna Safronova
University of Delaware

Date submitted: 27 Jan 2012 Electronic form version 1.4