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Parity Violation in Cs and Fr Z. ZUHRIANDA, University of Delaware, ULYANA SAFRONOVA, University of Nevada-Reno, 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 experimental work for Fr is in progress at TRIUMF [Sheng et al., J. Phys. B 43, 074004 (2010)]. In this work, we carried out high-precision relativistic all-order calculations of the spin-independent and spin-dependent PNC amplitudes in the $6s-7s$ transition in Cs and the $7s-8s$ transition in Fr using relativistic all-order method in which all single, double, and partial triple excitations of the Dirac-Fock wave functions are included to all orders of perturbation theory. Detailed investigation of the highly-excited state contributions to PNC amplitudes were carried out at the all-order level. These terms were recently demonstrated to give large contribution to the uncertainty of the extracted Cs weak charge Q_W value [V. A. Dzuba et al., Phys. Rev. Lett. 109, 203003 (2012)] and more accurate treatment was needed. The Cs all-order result for the spin-dependent amplitude was found to be consistent with the older atomic physics value of the anapole coupling constant.

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