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Electroweak interaction, parity nonconservation in heavy finite fermi-systems and dynamical enhancement of weak interaction

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Nowadays the PNC in the finite Fermi-systems has a potential to probe a new physics beyond the Standard Model. We systematically apply our combined nuclear (relativistic mean field model) and QED many-body perturbation theory method [2] to precise studying spin- independent and spin-dependent (SD) PNC effects. There are listed new results of the calculating the nuclear magnetic moments, hf structure, PNC amplitudes for a set of elements: 133Cs, 137Ba+, 205Tl, 223Fr, 173Yb with account of the exchange-correlation, Breit, weak e-e interactions, radiative, nuclear (magnetic moment distribution, finite size, neutron “skin”) corrections. Comparison with the SM and other data [1] is done. As exciting example we list our QW value of 173Yb QW=-92.31 [the PNC amplitude 9.707x10^(-10)iea] that differs of the SM QW=-95.44. The nuclear SD PNC interactions due to nuclear anapole moment, Z- exchange interaction from nucleon axial-vector (AnVe) currents, the combined hyperfine and spin-independent Z exchange interaction from nucleon vector (VnAe) currents are computed. In quantum many-body systems with dense spectra of excited states weak perturbation can be significantly enhanced. The PNC enhancement is studied too and new possibilities are examined.

[1] K. Tsigutkin et al.,Phys. Rev. Lett. 103, 071601 (2009); O. Khetselius, Phys. Scr. T135, 014023 (2009).
[2] A. Glushkov et al., Nucl. Phys. A 734, 21 (2004); A. Glushkov, O. Khetselius, L. Lovett, Recent Adv. in Theory of At. and Mol. Syst. 20, 125 (2010).

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