CAVITY-ENHANCED PARITY-NONCONSERVING OPTICAL ROTATION IN Hg, Xe, AND I

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Atomic parity-nonconservation (PNC) experiments provide a low-energy test of the Standard Model. However, atomic PNC experiments have proved to be very difficult, typically taking at least 10-20 years to complete. In addition, the measurements of anapole moments in Cs and Tl (the only such measurements to date, performed in the mid 1990s) appear to be inconsistent with each other. Atomic PNC experiments on radioactive isotopes of Fr and Ra are underway at collider facilities (TRIUMF and KVI Groningen, respectively), for which larger experimental signals are expected and several isotopes are available. Here, we describe our recent proposals for the measurement of PNC optical rotation in metastable Hg and Xe [1], and ground state I atoms [2]. A novel optical cavity is proposed which amplifies the optical rotation by about 10^4, and allows two signal reversals, therefore allowing room-temperature, table-top PNC experiments with large experimental PNC signals, and rapid signal reversals. We discuss the experimental sensitivity to anapole moments for odd-proton nuclei (in I) and odd-neutron nuclei (in Hg and Xe).

1 L. Bougas, G. E. Katsoprinakis, W. von Klitzing, J. Sapirstein, and T. P. Rakitzis, Phys. Rev. Lett **108**, 210801 (2012).

2 G. E. Katsoprinakis, L. Bougas, T. P. Rakitzis, V. A. Dzuba and V. V. Flambaum, Phys. Rev. A (*submitted*) http://arxiv.org/abs/1301.6947.