DNP10-2010-020053

Abstract for an Invited Paper for the DNP10 Meeting of the American Physical Society

Nuclear Electric Dipole Moment Calculations¹ WICK HAXTON, UC Berkeley and Lawrence Berkeley Lab

One of the most important constraints on CP violation in the nucleon and NN interaction is provided by electric dipole moment (EDM) limits for neutral diamagnetic atoms, particularly 199Hg. To extract CP-violating couplings from experiment, one must relate the atomic EDM to the underlying nuclear CP-odd moments, a task complicated by the atomic response, which largely shields the nucleus from the applied external electric field. The residual response – the Schiff moment – depends on corrections such as the finite size of the nucleus. Conventional Schiff-moment calculations have largely ignored one consequence of the screening: the cancellation between direct and polarization diagrams, which yields an answer that is suppressed by two powers of RN/RA, where RN and RA are the nuclear and atomic sizes, requires one to identify all other terms that contribute to the same order in the RN/RA power counting. We show that such terms arise from nuclear excitations associated with the dipole charge and transverse electric multipole operators, and discuss the consequences. We also describe higher T-odd moments that contribute up to the same order in the counting, and point out interesting nuclear structure and experimental consequences.

¹Work supported by the US Department of Energy and in collaboration with Satoru Inoue, Cheng-Pang Liu, and Michael Ramsey-Musolf