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NUCLEAR ANAPOLE MOMENT

V.F. Dmitriev and V.B. Telitsin

Budker Institute of Nuclear Physics, Novosibirsk, Russia

The atomic parity non-conservation (PNC) effects dependent on nuclear spin are expected to be dominated by contact electromagnetic interaction of electrons with the nuclear anapole moment (AM) [1]. The nuclear AM is induced by PNC nuclear forces. The first successful measurement of the AM of Cesium nucleus has been reported 3 years ago [2]. The immediate application of this measurement was the attempt to deduce the pion-nucleon weak PNC coupling constant f_π. The comparison of the measured AM value with the one calculated using an independent particle model leads to a value for f_π that exceeds by a factor 4 the value deduced from a PNC measurement in ^{18}F. Here we present more accurate calculation of the nuclear AM.

There are several contributions to the value of nuclear AM. The most significant and the least model dependent contribution comes from the odd nucleon. It is stable under variations of the single-particle potential. However, this contribution is strongly reduced by the core polarization. The reduction is partially compensated by the contribution of the core nucleons to the AM first discussed in [3]. For a set of nuclei we calculated both the effects of core polarization and the core nucleon contribution to the AM within RPA with effective nucleon-nucleon forces. Full single-particle spectrum including continuum has been used in the calculations. Our final magnitude of the AM remains reduced by a factor ≈ 2 compared to its independent particle value. The extracted value of f_π appears larger by a factor ≈ 2 than the DDH "best value".

References

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