

Study of time -reversal violation in the two-nucleon system

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In this contribution, we present a theoretical study of time-reversal violation (TRV) in the two-nucleon system. The interest of this study is motivated by the fact that the nuclear TRV interaction is induced by flavour-diagonal CP violating terms present in the Standard Model (SM), in particular the theta-term, or by physics beyond the SM [1]. Therefore, studying TRV-related observables as the electric dipole moment (EDM) of nuclei or asymmetries in the transmission of polarized neutrons in a polarized medium can allow to obtain information about these CP violating terms. In particular, there are plans to measure the EDM of the deuteron and other light-nuclei in dedicated storage rings [2].

The various sources of CP violation at fundamental level induce in principle an infinite set of CP-violating terms in the effective low-energy pion-nucleon Lagrangian, that, however, can be ordered by a power counting scheme. Using this counting scheme (chiral perturbation theory), we have derived, for the first time, the complete next-to-next-to-leading order TRV nucleon-nucleon interaction. This interaction is then used to calculate the EDM and other TRV observables of the two nucleon systems. The sensitivity of such observables to the various coupling constants will be discussed.

[1] J. Bsaisou et al., *Annals of Physics* 359, 317 (2015)

[2] Y.K. Semertzidis, arXiv:1110.3378

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