Contribution ID: **68** Type: **not specified**

Improving the hadron EDM upper limit using doubly-magic proton and helion beams

Monday, 18 July 2022 20:40 (20 minutes)

The upper limit on (time reversal symmetry T-violating) permanent hadron electric dipole moments (EDMs) is the PSI neutron EDM value; $d_n = (0.0 \pm 1.1_{\text{stat}} \pm 0.2_{\text{sys}} \times 10^{-26}$\,e.cm. This paper describes an experiment to be performed at a BNL-proposed CLIP project which is to be capable of producing intense polarized beams of protons, p, helions (He^3 nuclei), h, and other isotopes.
The EDM prototype ring PTR (proposed at COSY Lab, Juelich) is expected to measure individual particle EDMs (for example EDM_p for the proton) using simultaneous coumter-rotating polarized proton beams, with statistical error $\pm 10^{-30}$e.cm after one year running time, four orders of magnitude less than the PSI neutron EDM upper limit, and with comparable systematic error.
A composite particle, the helion faces T-symmetry constraints more challenging than the proton. Any measureably large value of $\delta = \text{EDM}_h - \text{EDM}_p wouldrepresentBSMphysics.TheplanistoreplicatePTRatBNL.Thedominantsyste$
$locking``doubly-magic'' 38.6 \ldots MeV protonand 39.2 \ldots MeV helionspintunes.ThisstabilizestheirMDM-$
$inducedin-planeprecessions, withoutaffectingtheirEDM-inducedout-of-planeprecessions.Thedominantsystematicer$
in a fixed field configuration.
Another systematic error cancellation will come from averaging runs for which both magnetic field and beam circulation directions are reversed. Precise magnetic field reversal is made possible by the reproducible absolute frequency phase-locking over long runs to eliminate the need for (impractically precise) magnetic field measurement.

In-person or Virtual?

In-person

Primary author: TALMAN, Richard (Laboratory of Elementary Particle Physics, Cornell University)

Presenter: TALMAN, Richard (Laboratory of Elementary Particle Physics, Cornell University)

Session Classification: Poster Session