

Controlling Systematics in the Search of Electric Dipole Moment With the Storage Ring Using Different Methods

A. Aggarwal on behalf of the JEDI collaboration

The Marian Smoluchowski Institute of Physics, Jagiellonian University, Poland

anjali.aggarwal@doctoral.uj.edu.pl

Measurement of EDM for proton and deuteron using storage ring was proposed upto accuracy of 10^{-29} e·cm for that it is necessary to consider effects which could mimic EDM signal. Elements of storage ring have complex fields, hence the fields gradients are present. Therefore, the magnetic dipole moment and electric quadrupole moment interaction with fields and their gradients must be considered. BMAD software was modified by all above effects and full T-BMT equation (with field gradients) are introduced. Preliminary calculations are done for quasi-frozen spin method.

Precursor experiment using COSY storage ring aims precision of 10^{-19} e·cm. Main source of systematic error is storage ring magnets misalignment which mimic EDM signal. Method of Fourier analysis of vertical spin time dependence was developed and it allows to distinguish between EDM and misalignments signals.

Magnets misalignment affect not only spin precession but also particles orbit. Steerer dipole magnets are used for orbit correction, it effects spin precession also. To investigate steerer effects on spin behaviour the standard kickers were replaced by the dipole magnets. Using Fourier method it is possible to reach 10^{-19} e·cm accuracy of EDM. The presented new method of systematic effects monitoring can be applied to any scenario proposed for EDM measurements using a storage ring.