Investigation of the spin coherence time for measuring the electric dipole moment of protons in the COSY cooler synchrotron

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The inability of the Standard Model (SM) to explain the matter-antimatter asymmetry in the universe is one of the most challenging problems in modern physics. The Electric Dipole Moment (EDM) of a subatomic particle is predicted by the SM and provides simultaneous violation of parity (P) and time reversal (T). Assuming CPT-theorem holds, an EDM is also a source of CP violation, which is needed to explain the matter-antimatter asymmetry. Measuring an EDM at a higher value than the SM prediction would therefore provide additional CP violation and would be a strong indication for physics beyond the SM.

Optimization of the Spin Coherence Time (SCT) plays a central role in storage ring EDM experiments, since a large SCT is required to achieve the statistical sensitivity for an EDM measurement. After a sufficient long SCT was achieved for deuteron beams, the JEDI-Collaboration (Jülich Electric Dipole moment Investigations) in Jülich is preparing a similar measurement for the SCT for protons at the storage ring COSY (COoler SYnchrotron). Many parameters indicate that for proton beams, the optimization procedure to realize long SCT is more difficult than for deuteron beams. Therefore, spin tracking simulations were performed with the software library BMAD to investigate the sextupole contributions. This talk will concentrate on the recent tracking results to optimize the SCT for a proton beam in the storage ring COSY.

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