Optimization of spin-coherence time for electric dipole moment measurements in a storage ring

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Abstract

Electric dipole moments are very sensitive probes of physics beyond the Standard Model. The JEDI collaboration is dedicated to the search for the electric dipole moment (EDM) of charged particles making use of polarized beams in a storage ring. In order to reach the highest possible sensitivity, a fundamental parameter to be optimized is the Spin Coherence Time (SCT), i.e., the time interval within which the particles of the stored beam maintain a net polarization greater than 1/e. To identify the working conditions that maximize SCT, accurate spin-dynamics simulations have been performed using BMAD. In this study, lattices of a "prototype" storage ring, which uses combined electric and magnetic fields for bending, and a "hybrid" storage ring using only electric bending fields with magnets for focusing, are investigated. This talk presents a model of spin behaviour in frozen-spin lattices that has been verified in both situations, as well as a technique to optimize the second-order beam optics for maximum SCT at any given working point.

Keywords: Storage Rings, EDM, Hybrid, Prototype, Polarized Beams, Spin Coherence Time