

Contribution submission to the conference Göttingen 2025

Simulations of Beam Dynamics and Beam Lifetime for the Prototype EDM Ring — ●SAAD SIDDIQUE for the JEDI and CPEDM Collaborations-Collaboration — GSI Darmstadt Germany

The matter-antimatter asymmetry may be explained through CP-violation by observing a permanent electric dipole moment (EDM) of subatomic particles. An advanced approach to measure the EDM of charged particles is to apply a unique method of "Frozen spin" on a polarized beam in an accelerator. To increase the experimental precision step by step and to study systematic effects, the EDM experiment can be performed within three stages: the magnetic ring COSY (Cooler Synchrotron Juelich), a prototype EDM ring and finally all electric EDM ring. The intermediate ring will be a mock-up of the final ring, which will be used to study a variety of systematic effects and to implement the basic principle of the final ring. The simulations of beam dynamics of prototype EDM ring with different lattices were performed to optimize the beam lifetime and to minimize the systematic effects. After getting beam losses estimations by using analytical formulas for preliminary design of prototype EDM ring, beam-target interaction have been studied in detail which helped to find optimized position of target in storage ring for minimum beam losses. After finding dynamic aperture by using more sophisticated program Bmad, a long term tracking is being performed along with beam-target interactions. Further investigations to reduce systematic effects are also under process.

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