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Simulations of Beam Dynamics and Beam Lifetime for the Prototype EDM Ring

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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 a storage ring. To increase the experimental precision step by step and to study systematic effects, the EDM experiment will be performed within three stages: the magnetic ring COSY*, 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 the prototype EDM ring with different lattices are carried out to optimize the beam lifetime and minimize the systematic effects. The preliminary design of the prototype EDM ring helped to estimate the beam losses by using analytical formulas. Beam-target effects with more detailed simulations are being studied for beam losses and the application of stochastic cooling to control beam emittance growth is also being studied by using a simulation program. Further investigations to reduce systematic effects are also in progress.

Footnotes

- Cooler Synchrotron Forschungszentrum Juelich Germany

Funding Agency

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Yes

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