



Contribution ID: 31

Type: **not specified**

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

Wednesday, 28 September 2022 10:00 (25 minutes)

The JEDI experiment is dedicated to the search for the electric dipole moment (EDM) of charged particles using storage rings, which can be a very sensitive probe of physics beyond the Standard Model. 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 with the code BMAD have been performed on the lattice of a “prototype” storage ring which uses a combination of electric and magnetic fields for bending. This talk will present some techniques to maximize SCT through the optimization of second-order focussing parameters, optimization strategies of the working point based on the analysis of the betatron functions and sustainability of the beam, and finally a discussion on the exclusive beam and spin dynamics effects of the electric component of bending fields.

Category

New Applications

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Session Classification: New Applications