Contribution ID: **61** Type: **not specified**

Polarized Electron and Hadron Beams at JLEIC

Thursday, 26 September 2019 14:20 (20 minutes)

Synchrotron radiation plays an important role in the polarization dynamics of an electron beam in the energy range of Jefferson Lab Electron-Ion Collider (JLEIC). High polarization of the JLEIC electron beam is achieved using two design features. The first one is a continuous full-energy top-off of the stored electron beam by a highly-polarized beam from CEBAF. The second one is arrangement of vertical spin orientations alternatively parallel and anti-parallel to the dipole fields in the two arcs of the figure-8 collider ring to neutralize the radiative Sokolov-Ternov effect on the electron polarization and compensate the energy dependence of the spin tune. For hadrons, the JLEIC figure-8 ring design compensates the primary effect of the ring arcs on their spins, i.e. the ring is "transparent" to the spins. This allows for efficient preservation of the source polarization as well as maintenance, control and manipulation of the stored beam polarization of any hadrons including deuterons using only additionally introduced weak magnetic field integrals that do not perturb the beam dynamics. The criterion for polarization stability is that the spin rotation induced by the weak field integrals must be much greater than that caused by lattice imperfections and beam emittances. We present the results of theoretical and numerical studies of the electron and hadron polarization dynamics in JLEIC.

Summary

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Session Classification: EIC

Track Classification: Polarimetry