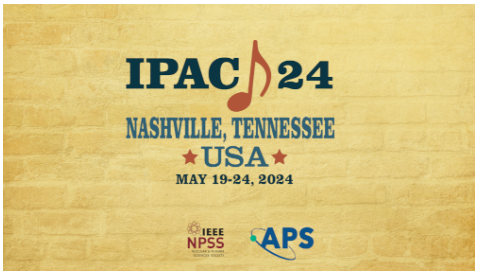

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Correction of the detector solenoid effect in the hadron storage ring of the Electron-Ion Collider

Monday, 20 May 2024 16:00 (2 hours)

The Electron Ion Collider design strategy for reaching unprecedented luminosities and detection capabilities involves collision of flat bunches at a relatively large crossing angle. The collision geometry is further complicated by a tilt of the Electron Storage Ring plane with respect to that of the Hadron Storage ring. In addition, the interaction point is placed inside the field of a detector solenoid. Reaching the design luminosity requires a precise control of the 6D bunch distribution at the IP accounting for all of the aforementioned design features. Effective head-on collisions are restored using crab cavities, which introduce a correlation of the particles' transverse coordinates with their longitudinal positions in the bunch, or crab dispersion. This paper describes local correction of the detector solenoid effect on the collision dynamics in the Hadron Storage Ring. The closed orbit distortion of the hadron beam by the solenoid is compensated at the interaction point and is localized to its nearby region by a set of dipole correctors. The solenoid effect on the bunch distribution parameters is corrected at the interaction point and localized to the interaction region using a set of skew quadrupoles in the adjacent sections of the ring. The Electron Ion Collider case is unique in that, in addition to the usual correction of transverse coupling and momentum dispersion, we also consider control of the interaction plane orientation and of the crab dispersion.

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