

Contribution ID: 889 Contribution code: MOPA051 Type: Poster Presentation

Nonlinear coupling resonances in the EIC electron storage ring

Monday, 8 May 2023 16:30 (2 hours)

The 18 GeV Electron Storage Ring (ESR) lattice of the Electron-Ion Collider (EIC) showed various undesirable effects in nonlinear Monte Carlo tracking, including a vertical core emittance exceeding radiation-integral predictions and a low asymptotic polarization. These problems were resolved in a newer lattice where dispersion in the solenoidal spin rotators was set to zero. Here we identify the cause of the effects as a 2nd order synchro-beta resonance which is driven by vertical dispersion in the quadrupoles of the rotators. The 5 and 10 GeV ESR lattices have small but nonzero dispersion in the rotators, and misalignments in the 18 GeV case will inevitably create some dispersion, so care must be taken that this 2nd order resonance is not excited. Zero dispersion in the spin rotators may therefore not be the best solution, and a new working point is sought that is not close to this resonance. The implications of this result on the design of the ESR –including achieving a longitudinal spin match –are explored.

Funding Agency

Supported by Brookhaven Science Associates, LLC under Contract No. DESC0012704 with the US Department of Energy, by National Science Foundation award number DMR-1829070, and by DOE award DE-SC0018370.

Footnotes

I have read and accept the Privacy Policy Statement

Yes

Primary author: SIGNORELLI, Matthew (Cornell University (CLASSE))

Co-authors: SAGAN, David (Cornell University (CLASSE)); HOFFSTAETTER, Georg (Cornell University

(CLASSE))

Presenter: SIGNORELLI, Matthew (Cornell University (CLASSE))

Session Classification: Monday Poster Session

Track Classification: MC1: Colliders and other Particle Physics Accelerators: MC1.A19: Electron-

Hadron Colliders