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Impact of proton IBS diffusion and electron beam size ripple on proton emittance growth for EIC

Monday 2 June 2025 16:00 (2 hours)

The Electron-Ion Collider (EIC) employs a flat hadron beam to achieve high luminosity, with the proton beam's vertical emittance being an order of magnitude smaller than its horizontal one. This small emittance ratio makes the vertical emittance highly sensitive to external noise. This study examines two types of noise: proton intra-beam scattering (IBS), a wide-band random diffusion, and electron beam size ripple, a narrow-band noise centered around 60 Hz in the US. Through beam-beam interaction, both sources contribute to vertical emittance growth. Mitigation strategies are proposed to preserve the flat beam aspect ratio and ensure stable collider performance.

Footnotes

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