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Multi-objective optimization of strong hadron cooler Energy Recovery Linac injector

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The Electron-Ion Collider (EIC) is the next-generation accelerator facility to be built at the Brookhaven National Laboratory. To achieve EIC's performance goals, an Energy Recovery Linac (ERL) cooler using Coherent electron Cooling (CeC) is designed to maintain the low emittance of the hadron beam. The ERL cooler requires high-current electron beams with low emittance and a uniform beam distribution. In the injector region of the ERL cooler, the space charge effect dominates the beam dynamics and causes energy spread and emittance growth. In this work, we present a multi-objective optimization strategy to minimize the emittance, energy spread, and dispersion in the space charge-dominated region of the ERL cooler.

Footnotes

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