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Emittance tuning of the FCC-ee high energy booster ring

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The Future Circular Collider (FCC), in its leptonic configuration has been chosen by CERN as main proposition for the next high-energy collider. This project aims to achieve luminosities one to two orders of magnitude higher than ever. Feasibility studies have led to the definition of tolerances on magnet imperfections and correction strategies. This is crucial for ensuring the performance of one of the main elements of the acceleration chain, the High Energy Booster (HEB) ring. The efficiency and overall performance of these strategies greatly influence new magnet specifications and tolerances, affecting main optic functions. Horizontal and vertical orbit corrections use horizontal and vertical kickers, respectively. Skew quadrupoles address vertical dispersion and transverse coupling. Normal quadrupoles correct the horizontal and vertical phase advances. This study simulates the distribution of these four corrector types to minimize the equilibrium emittance at the extraction energy of 45.6 GeV. The calculated strengths of these correctors and the associated misalignments are presented. The study also discusses the limitations and drawbacks of the proposed correction strategy.

Footnotes

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