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Updated monochromatization Interaction Region optics design for FCC-ee GHC lattice

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Measuring the Yukawa couplings of the Higgs boson remains one of the most critical and unresolved tasks since its discovery. The FCC-ee, with its extremely high integrated luminosity, provides a rare chance to probe the electron Yukawa coupling via s-channel Higgs production at a centre-of-mass energy of 125 GeV—on the condition that the energy spread can be reduced from 50 MeV to match the Higgs boson's natural width of 4.1 MeV. To achieve this precision, a monochromatization mode has been proposed, involving a special interaction region (IR) optics configuration with opposing-sign nonzero dispersion at the interaction point (IP). An initial optics layout and early beam dynamics studies have been conducted using version 22 of the FCC-ee GHC lattice. This paper introduces a refined and optimized monochromatization IR optics design, adapted to the updated 2023 version of the FCC-ee GHC optics.

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