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Global betatron coupling compensation for the hadron storage ring of the Electron-Ion Collider

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The Electron Ion Collider (EIC), to be constructed at Brookhaven National Laboratory, will collide polarized high-energy electron beams with hadron beams, achieving luminosities up to $1e+34 \text{ cm}^{-2} \text{ s}^{-1}$ in the center-mass energy range of 20-140 GeV. The Hadron Storage Ring (HSR) of the EIC will utilize the arcs of the Relativistic Heavy Ion Collider (RHIC) and construct new straight sections connecting the arcs. In this article, we will examine all available skew quadrupoles currently in the HSR lattice and explore possible schemes for future global betatron coupling correction with RHIC-like decoupling feedback system. The effects of detector solenoids and quadrupole rolls are estimated at injection and stored energies. We also studied the decoupling requirements for generating and maintaining large transverse emittance ratio beams in the HSR.

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