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Self-correction coil for RCS dipole in Electron Ion Collider

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The Rapid Cyclotron Synchrotron (RCS) is an acceleration ring designed for boosting the electron energy from 400 MeV after the LINAC to 1 GeV prepared for injection into the Electron Storage Ring (ESR). Operating in a pulsed mode at 1 Hz, the RCS accelerates four consecutive bunches with dipole magnet ramping rapidly at each injection. Rapid ramping of the magnetic field induces eddy currents, causing delays and high harmonic effects which are detrimental to low-energy electron bunches. To mitigate this, cost-effective multi-turn coils with specific patterns are proposed. These coils, powered by eddy currents from main dipole field ramping, generate counter fields to cancel selected high harmonic components. This paper explores the coil pattern selection process.

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