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Electron storage ring injection considerations for Electron-Ion Collider

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The Electron-Ion Collider (EIC) aims to achieve a peak luminosity of 10ˆ34 cmˆ−2sˆ−1 through polarized electron-proton collisions. The Electron Storage Ring (ESR) is designed to deliver high-charge electron bunches of up to 28 nC with a dynamic aperture of 10σ in all three planes. Given the limited polarization lifetime, frequent electron bunch replacement is necessary, making the swap-out injection scheme the baseline design to address these demands within the constraints of the small dynamic aperture.
The Rapid Cycling Synchrotron (RCS) plays a pivotal role in electron accumulation, acceleration, and injection into the ESR. Beyond the baseline swap-out injection, alternative approaches, such as injecting multiple RCS bunches into a single ESR bucket and top-up injection, are explored to evaluate their potential in overcoming operational challenges. These investigations provide a comprehensive assessment of strategies to meet the stringent performance requirements of the EIC.

Footnotes

Paper preparation format

LaTeX

Region represented

America

Funding Agency

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