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Hybrid on- and off-axis injection scheme optimisation for the FCC-ee collider

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In order to maximize the integrated luminosity of the future circular lepton collider (FCC-ee), a top-up injection scheme is required. Amongst the four operation modes of FCC-ee, the Z operation mode has the highest stored beam energy in the collider ring with about 20 MJ per beam. Consequently, it is for this mode that the injection scheme is primarily optimized and is the focus of this contribution.

Due to the synchrotron radiation cone of the injected beamlet at the interaction point (IP), the conventional off-axis injection scheme is not favored. As for the on-axis injection, it necessitates an energy offset for the injected beam and sufficient dynamic aperture in the collider ring. However, the energy acceptance of collider ring is only around $\pm 1\%$ for the latest baseline lattice of the Z mode, making this scheme challenging. Therefore, an hybrid on- and off-axis injection scheme is proposed to satisfy the requirements of dynamic aperture and energy acceptance. This contribution introduces the concept and discusses the optimization process used to balance energy and position offset of the injection scheme.

Footnotes

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Europe

Primary authors: YUE, Sen (European Organization for Nuclear Research); DUTHEIL, Yann (European Organization for Nuclear Research)

Co-author: JOHNSON, Elliott (European Organization for Nuclear Research)

Presenter: JOHNSON, Elliott (European Organization for Nuclear Research)

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