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FCC-ee Booster Design

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In the context of the FCC IS European study, which investigates the feasibility of a 100 km circular e^+e^- collider for the future high energy physics research, we present the status of the High Energy Booster (HEB) ring for the proposed e^+e^- option. The HEB is the ring accelerating the electrons and positrons up to the nominal energy before injection into the collider. In order to perform precision measurements of the Z, W and H bosons, as well as of the top quark, unprecedented luminosities are required. To reach this goal and to fill the collider, it is mandatory to continually top up inject the beams with a comparable emittance to the collider ones, and with a bunch charge variation below few %.
The main challenges of the HEB are the rapid cycling time, allowing to reach the collider equilibrium emittance, and the minimum beam energy injected into the booster that allows a stable operation.
From the ring optics point of view, one of the issues is that the final energy in the booster depends on the collider physics case. One optimum optics for a given energy case may be different from another. For the low final energies (Z, W), the characteristics time to reach the equilibrium emittance may be greater than the cycling time.
The other challenge is the injection energy. At injection, the dipole magnetic field is so low that the field quality is hardly reproducible from one cycle to another.
We present the status of the optics design of the HEB, and the impact of the magnetic field imperfections on the dynamic aperture at injection.

In-person participation

Yes

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