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Design of the FCC-ee injector linacs up to 20 GeV beam energy

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The FCC-ee injector complex aims to deliver tunable, high-charge electrons and positron bunches for injection into a collider operating at center-of-mass energies from 90 to 365 GeV. The injector complex includes multiple linacs that sequentially boost the energy of the bunches to the booster injection energy of 20 GeV. This work addresses the significant challenges posed by the required beam parameters. We designed the electron (up to about 3 GeV) and the high energy (up to 20 GeV) linacs to provide very limited emittance growth due to static imperfections, maximum acceleration efficiency, excellent stability of the beam transverse jitter, and to match the requirements on the bunch length and single- and multi-bunch energy spread as well. An energy compressor system has been foreseen, to provide flexibility to scan beam charges across a wide range without compromising the final energy spread. This paper summarizes the comprehensive design and optimization studies conducted, demonstrating that the proposed linac system meets all current requirements for efficient injection into the booster ring, paving the way for the ambitious operational goals of the FCC-ee accelerator complex.

Footnotes

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