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The FCC-ee Preinjector and the PSI Positron Production at SwissFEL

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The international FCC study group published in 2019 a Conceptual Design Report for an electron-positron collider with a centre-of-mass energy from 90 to 365 GeV, a circumference of 98 km and beam currents of up to 1.4 A per beam. The high beam current of this collider create challenging requirements on the injection chain and all aspects of the linac need to be carefully reconsidered and revisited, including the injection time structure. The entire beam dynamics studies for the full linac, damping ring and transfer lines are major activities of the injector complex design. A key point is that any increase of positron production and capture efficiency reduces the cost and complexity of the driver linac, the heat and radiation load of the converter system, and increases the operational margin. The PSI Positron Production (P_{cubed}) project, currently in development at PSI, is the proposed proof-of-principle experiment for a potential FCC-ee positron source. Capture and transport of the secondary positron beam from the production target to the damping ring are a key challenge for FCC-ee, due to large emittance and energy spread. The use of novel matching and focusing methods has been studied, such as high temperature superconducting (HTS) solenoids, where recent simulations show considerably higher positron yield with respect to the state of the art. The experiment is to be hosted at SwissFEL at PSI, where a 6 GeV electron beam and a tungsten target can be used to generate the positron distribution. In this contribution we will give an overview of the status of the injector complex study and will introduce the P3 project both developed in the context of the CHART collaboration.

In-person participation

Yes

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