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Student Design Project: The eSPS at CERN

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The aim of this year's JAI student project is to prepare a design of the primary electron beam for the electron-Super Proton Synchrotron (eSPS) at CERN. The facility re-enables the SPS as an electron accelerator, and leverages the development invested in the Compact Linear Collider (CLIC) technology for its injector and accelerator R&D infrastructure.

The SPS has, in the past, accelerated electrons and positrons from 3.5 GeV to 22 GeV when it was used as the injector to the Large Electron Positron (LEP) collider. It is now proposed to use the SPS simultaneously as an accelerator and as a very long pulse stretcher to provide an electron beam to a new experimental area. The electron injector would be a 3.5 GeV compact high-gradient linac based on CLIC technology injecting pulses into the SPS. The beam would then be accelerated to 16 GeV, using an 800 MHz superconducting radiofrequency (RF) system, similar to what is needed for the future electron-positron Future Circular Collider (FCC-ee). The electrons would then be extracted at 16 GeV using a slow resonant extraction. The extracted beam will be transported to a new experimental area where the particle detectors will be located.

The student work concerns the eSPS and the investigation of this new electron beam facility, focusing on the general lay-out, the lattice design and the choice of magnets & magnet design for the transfer line from the 3.5. GeV compact linac to the SPS, and the design of the RF system in the SPS.

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