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JAI Student Project on scSPS

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Future Circular Collider for hadrons (FCC-hh) requires a high energy injector. Upgrading the current LHC injector, the Super Proton Synchrotron (SPS), to a superconducting synchrotron (scSPS) could provide adequate extraction energy up to 1.3TeV. Presented here are results of a design study for such an upgrade with a focus on the lattice design, dipole, quadrupole, and sextupole magnets, and RF cavities. In particular, the challenge of the increased energy swing is addressed, from injection to the scSPS at 26GeV to extraction at 1.3TeV. A design for a dispersion suppressor is suggested and the cell dimensions optimised to fit in the existing SPS tunnel. Preliminary designs for the magnets are proposed, including a study of the operating temperature and field quality. A single cell superconducting RF cavity design is presented, with a 200MHz operating frequency, and the large bandwidth requirements are discussed.

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