Joint DESY and University of Hamburg Accelerator Physics Seminar

Tuesday, February 2-nd, 2010

(16:00 in Room 459/30b)

Simulations of the H^- Charge Exchange Injection into the CERN Proton Synchrotron Booster with Linac4

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Abstract

The CERN PS Booster (PSB) is the first synchrotron of the LHC proton injection chain. The main performance limitation are direct space charge effects at low energy. To mitigate direct space charge effects the present PSB injector Linac2, providing 50 MeV protons, will be replaced by Linac4, envisaged to provide 160 MeV H^- ions from 2014 onwards. The hardware required for the planned H^- charge exchange injection, in particular the closed orbit bump in the injection section (chicane), introduces perturbations of the lattice due to additional edge focusing. Two different schemes aim at mitigating the impact of these perturbations on PSB performance were tested. First an active compensation with additional quadrupole magnets at dedicated positions in the ring and second passive compensation with modified gradients at the chicane magnets and a faster chicane. To find the best setting for the injection, simulations with the particle tracking code ORBIT were carried out for both schemes and the different results were compared. The simulations include the apertures, acceleration, space charge effects, scattering at the injection foil and planned schemes to populate the available phase space in transverse and longitudinal plane (painting). The lattice perturbations due to the injection hardware and their compensation on PSB performance have been studied as well.

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