Contribution ID: **2294** Contribution code: **SUPS005** Type: **Student Poster Presentation**

Optimizing multi-turn extraction at CERN using transverse feedback

Sunday 1 June 2025 14:00 (2 hours)

Initial experimental investigations of transverse beam splitting, carried out at the CERN Proton Synchrotron, have demonstrated that transverse feedback is highly effective in controlling the characteristics of the transversally split beam. The feedback notably improves the intensity distribution among the beamlets and the emittance of the core, which is the portion of the beam remaining near its centre after the resonance-crossing process. The transverse feedback is set in resonance with the horizontal betatron tune while the tune crosses the fourth-order resonance, creating a double-resonance condition. A simple Hamiltonian model has been employed to explore the underlying double-resonance mechanism. This paper thoroughly examines detailed numerical simulations based on a realistic lattice model alongside beam measurements, to identify optimisation strategies for the use of transverse feedback in controlling the properties of split beams.

Footnotes

Paper preparation format

LaTeX

Region represented

Europe

Funding Agency

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Session Classification: Student Poster

Track Classification: MC5: Beam Dynamics and EM Fields: MC5.D02 Nonlinear Single Particle Dynamics Resonances, Tracking, Higher Order, Dynamic Aperture, Code Developments