Multi-turn Extraction: Splitting the PS Beam in Transverse Phase Space

An Introduction to my Project

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Group

- Department: Beams (BE)
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  - 1991 — Associate at CERN
  - 1993 — Ph.D. in Mathematical Physics
    University of Bologna, Italy
  - 1997 — Staff at CERN
- Secondary Supervisor: Cédric Hernalsteens
  - 2011 — Master's Degree in Engineering Physics
    Université Libre de Bruxelles, Belgium

Big Picture

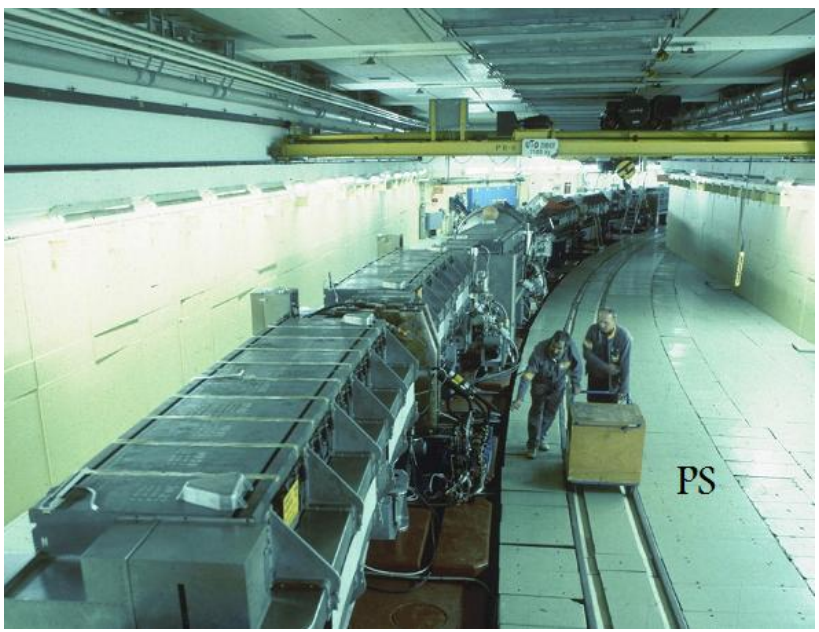
Extracting the beam from the

- Proton Synchrotron: 1959, 28 GeV, 628 m

injecting into the

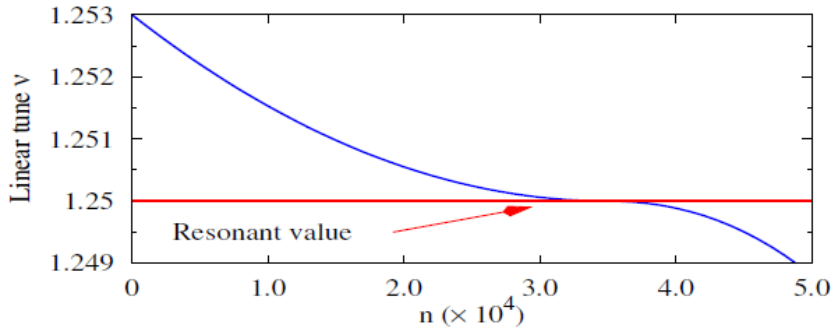
- Super Proton Synchrotron: 1976, 450 GeV, 6.9 km

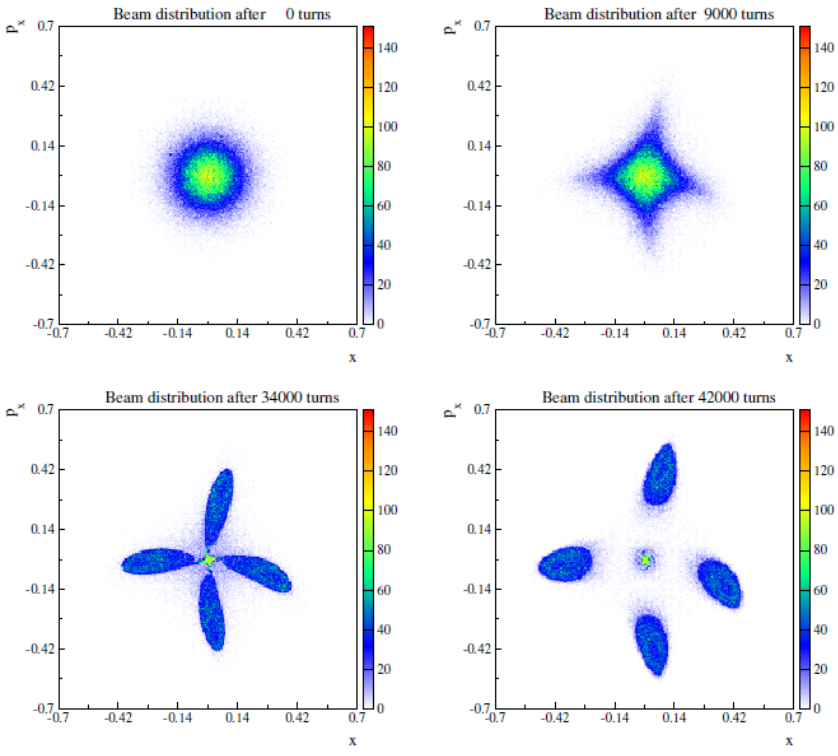
over several turns, on its way to fixed target collisions such as the CERN Neutrinos to Gran Sasso (CNGS) experiment.



Background

- Multi-turn Extraction has been implemented in recent years...
- Nonlinear magnetic fields create stable islands in the beam's horizontal phase space, separating the beam into parts for clean extraction.

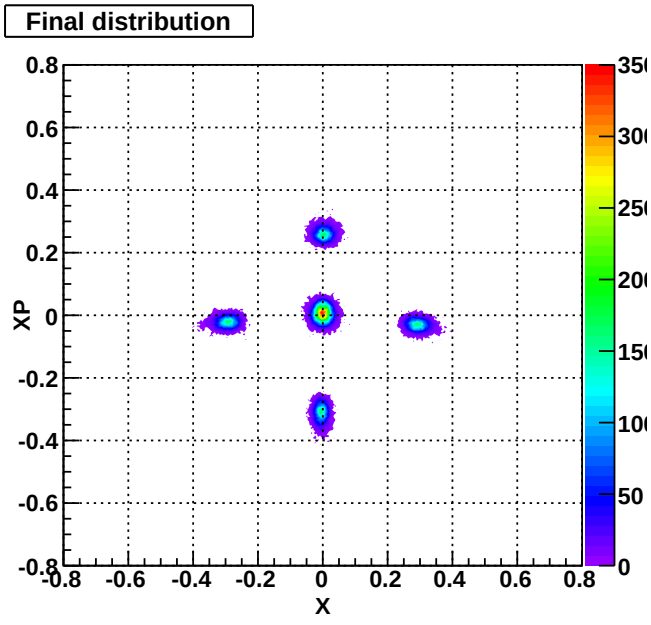


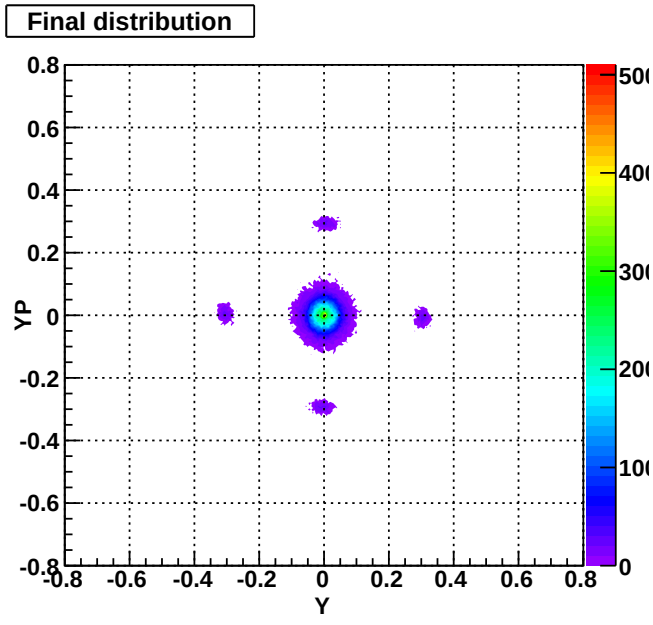


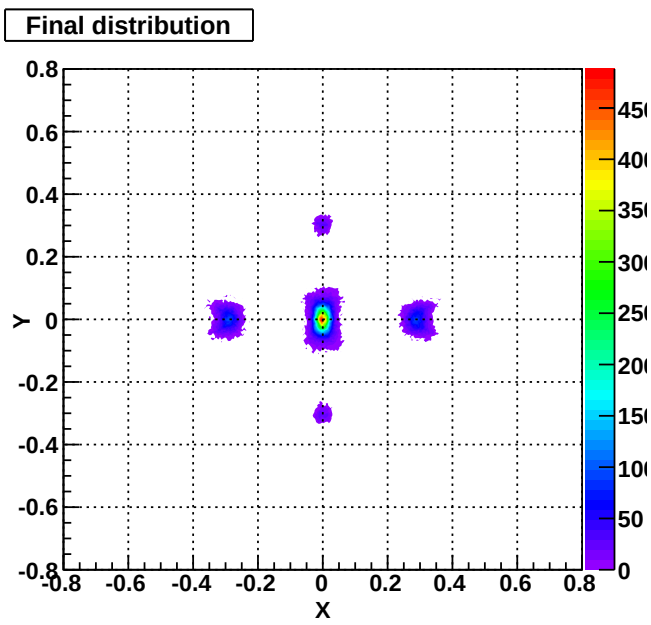
My Project

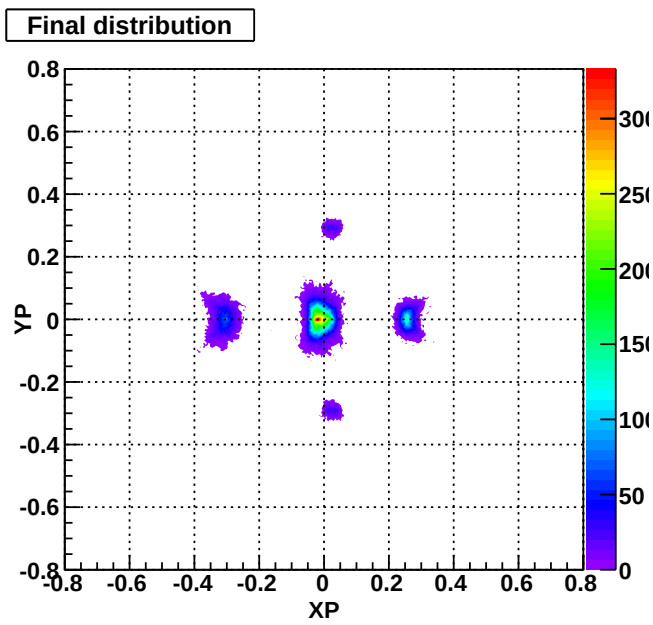
- Experiment, through simulations, with the optimization of beam-splitting in xy-space.
- Understand, through analytical and numerical analysis of a simple Hamiltonian, the separate effects of growing and traveling stable phase-space islands on particle capture.
- Apply discoveries to a realistic Hamiltonian, in which growing and traveling cannot be separated, to optimize beam-splitting.

Some Early Results









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