





LHC Injectors Upgrade

PSB Beam Dynamics milestones for 2019/2020

S. Albright, F. Antoniou, F. Asvesta, C. Bracco for the LIU PSB Beam Dynamics WG





Outline

- LIU structure
- Injection Studies
- Transverse beam dynamics
- Longitudinal beam dynamics

LIU structure

ATS management

LIU/HL-LHC EC
IEFC
LS2C
LMC

LIU Project Executive committee

M. Meddahi G. Rumolo

Project Unit

Safety Officer: A. Funken
Budget Officer: S. Prodon
Installation Coordination
Officer: J. Coupard (Dep. F. Pedrosa)
Admin. Support: L. Mainoli

LIU Commissioning
Coordination
V. Kain, G. Rumolo,
A. Huschauer

LIU Beam Dynamics
Coordination
G. Rumolo, H. Bartosik

LIU Linac4 LS2 Technical
Coordination (Ad-Hoc)
Chair J.B. Lallement

LIU ions PS Injectors
Technical Coordination
(Ad-Hoc)
Chair R. Scrivens

LIU PSB LS2 Technical
Coordination
Chair G.P. Di Giovanni
Deputy B. Mikulec

LIU PS LS2 Technical
Coordination
Chair K. Hanke
Deputy H. Damerau

LIU SPS LS2 Technical
Coordination
Chair B. Goddard
Deputy E. Shaposhnikova

Linac4 Commissioning
WG
Chair B. Mikulec
Deputy A. Lombardi

LIU ions PS injectors
Commissioning WG
Chair R. Alemany

LIU PSB Commissioning
WG
Chair G.P. Di Giovanni
Deputy C. Bracco

LIU PS Commissioning
WG
Chair F. Tecker
Deputy: D. Cotte

LIU SPS Commissioning
WG
Chair K. Li

Linac4 BD WG
A. Lombardi/J.B.
Lallement/G. Bellodi

LIU ions PS injectors BD
WG
Chair N. Biancacci

LIU PSB BD WG
S. Albright/F. Antoniou/
C. Bracco

LIU PS BD WG
A. Huschauer/
H. Damerau/M. Fraser

LIU SPS BD WG
E. Shaposhnikova/
H. Bartosik



Injection studies

- Space charge simulations for ISOLDE beam w/o long. painting
- Review painting functions for all beams
- Machine learning applied to KSW painting
- Transfer line optics with Space charge
- BSW fringe field effects



Transverse beam dynamics

- Optics studies
 - Wrap-up all the measurements of 2018: What did we learn?
 - Preparation for the commissioning (planning + simulations)
- Brightness studies
 - Wrap up all the measurements done in 2018
 - Understand the impact of deconvolution algorithms and distributions' shapes on emittance reconstruction
- Space charge simulations
 - Set up py-orbit for the PSB and establish a common model to be used (ABP/ABT)
 - Space charge simulations for LHC and high intensity beams
 - Simulations including errors and chicane with imperfections
 - Study in simulations the pros and cons for above the half integer injection
 - Simulations for Q4Q3 vs Q4Q4 optics (coupling resonance excitation by space charge)



Transverse beam dynamics

- Impedance studies
 - Follow up on the recently discovered unmatched termination of the extraction kicker being the source of the horizontal instability observed at 160 MeV
 - Show in simulations what are the implications of correcting this mismatched termination
 - Simulations including the transverse feedback
- Orbit and misalignment studies
 - Develop the tool to find optimal misalignment proposal for all 4 rings



Longitudinal beam dynamics

- Injection beam dynamics and longitudinal painting
 - Effect of fixed frequency with $dB/dt > 0$
 - Optimum beam parameters from Linac4 for different cycles
 - Chopping patterns for high intensity beams and impact of fixed dE/dt of Linac4
- Controlled Longitudinal Emittance Blow-up
 - Optimum approach for blow-up and longitudinal shaving
- Tomography
 - Technical student started 1st February to work on Fortran \Rightarrow C++ translation and code extension
 - Summer student requested to study sources and magnitude of uncertainty
- Impedance
 - Current status of model
 - Structures simulated
 - Missing items



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