



LHC Injectors Upgrade





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LIU-PSB Beam Dynamics Working Group Introduction and objectives

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Purpose of this WG

- The LIU/HL-LHC projects require a factor of 2 increase in the intensity of the 25ns LHC beams
- PSB will go through major upgrades in order to reach this goal
 - Higher injection energy: 50MeV \rightarrow 160 MeV
 - New injection scheme: H- injection will replace the current MT injection
 - Transverse and longitudinal painting
 - Higher extraction energy: 1.4GeV \rightarrow 2GeV
- Many beam dynamics studies were dedicated the last years on the good performance of the PSB after connection with LINAC4
- The aim of this forum is to continue and closely follow-up the Beam Dynamics studies of the PSB to assure the good performance of the machine as well as steer the priorities
 - Study the impact on all other beams as well (i.e. MTE beams)
- Complement the efforts of the PS and SPS WG
- Report back to the LIU/LIU-PSB management



Purpose of this WG

- We will cover subjects in both transverse and longitudinal beam dynamics
- A **list of studies** have been prepared and prioritized (see next slides). Please go through it and **give us your feedback** about different priorities or missing subjects!



List of transverse BD studies

- Beta-beating analysis with BTMS
- PSB alignment studies
- Resonance compensation studies
 - Loss maps
 - Driving terms with BTMS for systematic resonance compensation and better understanding of the non-linear model
- TFB commissioning
- Transverse emittance studies
 - Preservation along the cycle
 - Dispersion measurements as input to WS measurements
 - Testing the performance of the SEM GRID in view of LIU beams and comparison with WS
- Impedance model
- Validation of the performance of new WS prototype (R₃H)
- Injection losses and collimation studies
- Measurement of Space-charge tune spread with quadrupolar BPM
- Tail repopulation studies



List of longitudinal BD studies

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- B-train commissioning
- Phase noise blow up
- Triple harmonic ($h_1+h_2+h_3$) capture for bunch flattening at injection
- BCMS 1.5 eVs
- Optimize magnetic cycle (can the ramp be slower)
- Finemet reliability run
- Phase alignment of H₁ with finemet and ferrite cavities
- Effect of 100s steps of LLRF
- Induced voltage in Finemet cavity for different bunches
- Phase loop calibration for simulation bench-marking
- Synchronization of LINAC₄ and PSB and longitudinal painting



Other studies

- LHC beam production in the 3+3 scheme
- Extraction at 160 MeV (dedicated MD)
- PSB-PS TL and impact on PS injection will be mainly followed-up at the LIU-PS WG



Practical issues

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- Meet once every 3-4 weeks
 - Monday 2:00-3:30, room 864-2-B14 (is this ok for everybody?)
- Presentations should be “**work in progress**” oriented
 - For feedback and discussion
- **Open** to everybody
 - Feel free to forward the invitation to anyone that could be interested in the subjects
- **We strongly encourage documenting the work done!**
- A **common gitlab** has been established by Andrea ([link](#)) and everyone is welcome to **share** his/her **tools**!
- A twiki page is being set-up with useful information and instructions.
We invite everybody to give feedback with the beams you use and you are planning to use next year