CERN

ABT plans

LHC MD days 2020

Y. Dutheil, on behalf of TE-ABT

List of studies to be completed outside of MDs

- Beam induced heating at MKI cool
  - Needs long physics run
  - Will be done parasitically
- MKD & MKI beam based waveform characterisation
  - Machine protection qualification and performance characterisation required before the start of the run
  - Will be done during commissioning
- TDIS and TCDIL
  - New HW, controls and MP checks done before the run
  - Setup and validation will be done during commissioning

Tail population and batch/train spacing at high intensity

New!!

Motivation:

- First and last bunches of a batch suffer from injection kick error in the SPS with 200 ns spacing and in the LHC with 800 ns
  - No effect on within measurement precision but increased population of tails observed from losses on transfer line collimators
  - Quantify the effect with HL-LHC intensity
  - Same questions for the LHC injection with 800 ns train spacing

Merit:
Understanding of batch & train spacing limits with high intensity beams

Beam/interlock conditions

- Injection, 450 GeV, both beams
- Trains of up to 288 bunches, high intensity
- Need 200 and 800 ns setting up with single bunches (INDIV and PILOT), hence required initial MD in the SPS for 200 ns setting up with high intensity
- **Time: 4 hours dedicated MD**

Caveat: need proper setup of beam at injectors!

Participants: ABT-BTP

Injection of High Intensity Beams

New!!

Motivation:

- Prepare for injection of HL-LHC standard beams. Provide support for any MD requiring injection of high intensity beams

Merit:

Evaluate margins in terms of losses and injection oscillations when injecting high intensity beams, identify potential limitations and apply mitigations (TCDIL setup, SPS scraping, BLM sunglasses etc.)

Beam/interlock conditions

- Injection, 450 GeV, both beams
- Trains of up to 288 bunches, as high as available intensity per bunch
- If needed: adjust TCDIL, BLM sunglasses.
- **Time: 4 hours dedicated MD. 1-2 hours at beginning of each MD**

Caveat: need proper setup of beam at injectors!

Participants: ABT-BTP

Secondary halo interception at TCDQ

New!!

Motivation:

- Assess beam load at the TCDQ and downstream magnets during nominal operation due to secondary halo interception
- Collect data for benchmarking with FLUKA simulations and extrapolation to operation with HL-LHC beams

Merit:

Insure that losses due to secondary halo interception at the TCDQ will not induce unwanted beam dumps or quenches at the downstream magnets plus collect data for R2E predictions for HL-LHC.

Beam/interlock conditions

- Full machine (as high as available intensity per bunch) at 450 GeV, injection optics with collimators at collision settings , circulating beam, beam1 and beam2
- One train of 12 bunches (or more? To be further studied, <=1.8e11 ppb) at Top energy, collision optics, beam1 and beam2
- Excite beam with ADT to produce losses at collimators and check losses at TCDQ and downstream elements
- Possibly vary TCDQ settings while respecting collimator hierarchy and evaluate loss evolution
- Change BLM thresholds at IR7 and IR6 to avoid dumping, tune ADT settings
- **Time: 8 hours (+ 8 hours). HIGH priority!**

Participants: ABT-BTP, A. Lechner, D. Valuch.

Summary

MD	Time	Priority
Tail population and batch/train spacing at high intensity	4h	Medium
Injection of High Intensity Beams	4h	Medium
Secondary halo interception at TCDQ	8h (+8h)	High

Thank you