LHC Intensity Ramp-Up TS1 2018

MPP 8/6/2018

J. Uythoven, M. Zerlauth, D. Wollmann, J. Wenninger

Case I: Standard Optics

- LMC 28/03/2018:

Ramp-up scenarios after stops of nominal operation

Stop > 48 h with massive HW + SW interventions	Stop > 48 h without massive HW + SW interventions	Triplet events with non-reversible position changes

- One fill with either **pilot bunches or max 2-3 nominal** bunches into SB (cycle revalidation etc)
- One fill with ~**50 bunches** and about 1 - 2 hours of stable beams
- One fill with **600 bunches** and **min. 2 hours** of stable beams (known intensity step to disentangle wrong settings, de-conditioning, etc. from intensity dominated effects at full intensity)
- If > 2000 bunches reached, one fill with about **half max number of bunches** and about 5 hours of stable beams
- **Back to pre-stop** intensities

Total 3-4 fills for ramp-up

http://lpc.web.cern.ch/SpecialRunConfigurations_2018.htm

- We seem to be LPC Special Run Coordination compatible, applying some small adjustments
  - 1 h of head-on minimum for each step is OK
- Some additions to the LPC request:
  - Move in Roman Pots at each fill, starting at 150 bunches
  - Total separation not more than 5 σ, one plane at a time
  - As of 1200 b onwards, start with finding the head-on before separating
  - As of 1200 b onwards, go through crossing angle and beta* exercises
- This results in →

Standard

- One fill with either **pilot bunches or max 2-3 nominal** bunches into SB (cycle revalidation etc)
- One fill with ~**50 bunches** and about 1 - 2 hours of stable beams
- One fill with **600 bunches** and **min. 2 hours** of stable beams (known intensity step to disentangle wrong settings, de-conditioning, etc. from intensity dominated effects at full intensity)
- If > 2000 bunches reached, one fill with about **half max number of bunches** and about 5 hours of stable beams
- **Back to pre-stop** intensities

Total 3-4 fills for ramp-up

From LPC SRC* 2018

- 2 – 3 nominal, collide and dump
- 150 b Calibration transfer fill.
  2h: sep to μ = 0.5
  0.5 h: fully separated → **max 5 σ sep., 1 plane at a time**
  1 h: μ scan
  1 h: head on (MPP request) → **RP**
- 600 b
  1 h head-on → **RP**
  3h at μ = 0.3 (AFP)
- 1200 b
  Optimise head-on (feed-back on settings)
  1 h: μ-scan with sep. at μ = 0.3
  1 h: head-on (MPP)
  3 h: μ = 0.5 for AFP/HI → **RP**
  1 h: Go through angle and beta* level.
- 2460 b
  Optimise head-on (feed-back on settings)
  1 h: μ-scan with sep. at μ = 0.5
  9 h: μ = 2 → **RP**
  1 h: Go through angle and beta* level.

RPs should be inserted for all fills

http://lpc.web.cern.ch/SpecialRunConfigurations_2018.htm

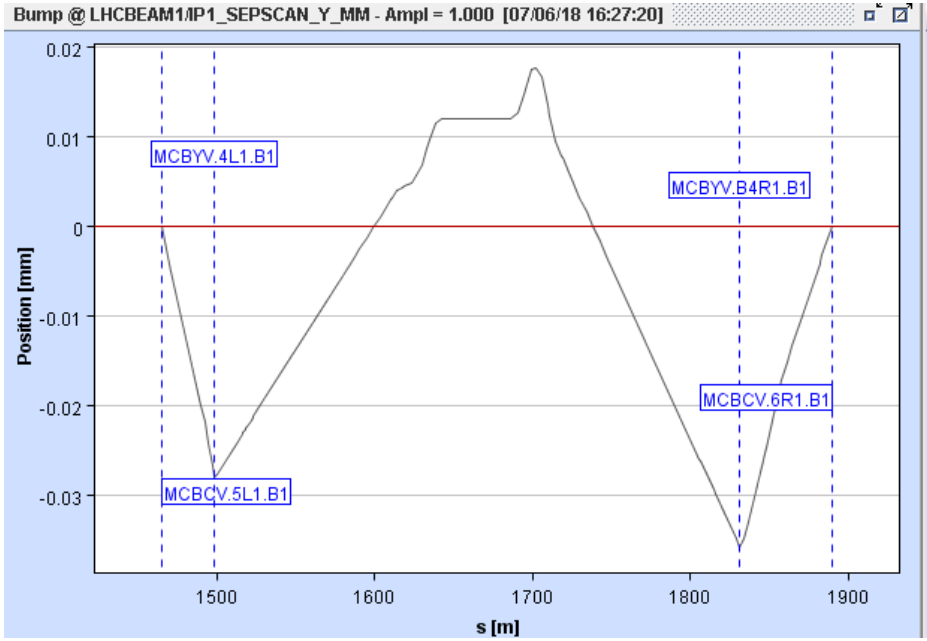
Case II: 90 m Intensity Ramp-Up

- 100 ns bunch spacing
  - 72 bunches
  - 300 bunches with trains of 72 b
  - 738 bunches with trains of 72 b
- 50 ns bunch spacing
  - 300 bunches
  - 700 bunches with trains of 144 b
  - 1452 bunches with trains of 144 b

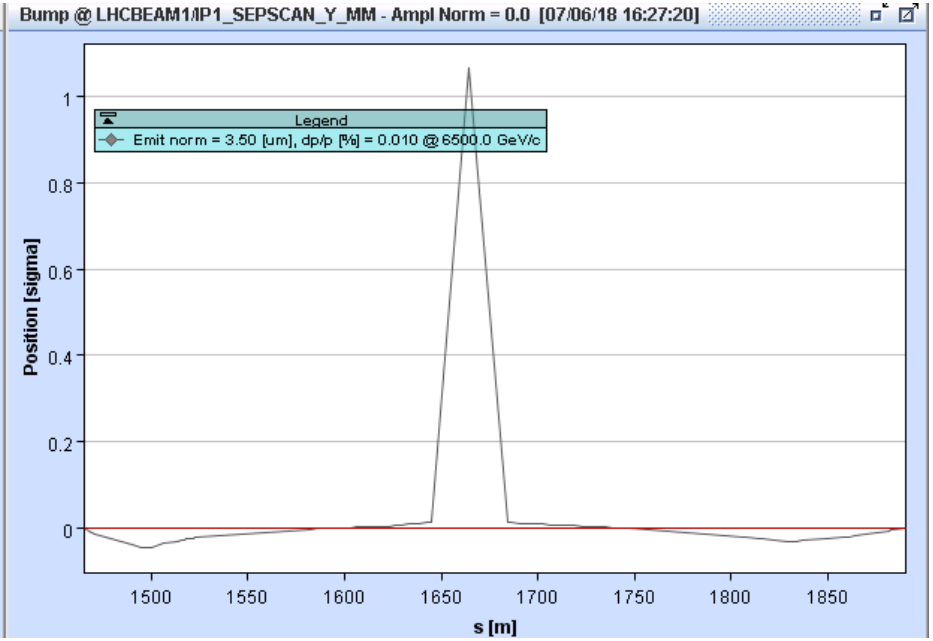
- In the intensity ramp-up, require 2 hours of stable beams, followed by a check on beam induced heating
- For all fills the AGK should be adjusted to 288 b @ 25 ns
- Together with the V/d Meer we should aim for only two changes of the AGK settings: one before the 90 m – V/d Meer period and one to put it back after

Spare slide from Jorg

Separation in mm



Separation in σ



At 30 cm, a 1 sigma per beam separation moves the beam by no more than 0.05 sigma in the entire bump area outside the IP (~20% less at the TCT),