

LHC-Beam Commissioning Working Group

Notes from the meeting held on
13 April 2010

Present: Carmen Alabau, Ralph Assmann, Tobias Baer, Wolfgang Bartmann, Chiara Bracco, Roderik Bruce, Oliver Bruening, Helmut Burkhardt, Elena Chapochnikova, Pierre Charrue, Laurent Deniau, Lene Drosdal, Lyn Evans, Massimiliano Ferro-Luzzi, Kajetan Fuchsberger, Massimo Giovannozzi, Brennan Goddard, Per Hagen, E. Barbara Holzer, Mike Lamont, Yngue Levinsen, Malika Meddahi, Gabriel Mueller, Giulia Papotti, Mario Pereira, Stefano Redaelli, Stefan Roesler, Federico Roncarolo, Frank Schmidt, Rüdiger Schmidt, Katarina Sigerud, Matteo Solfaroli, Ralph Steinhagen, Marek Strzelczyk, Jan Uythoven, Walter Venturini Delsolaro, Jörg Wenninger, Simon White, Uli Wienands, Daniel Wollmann.

Excused: Reyes Alemany, Gianluigi Arduini, Roger Bailey, Rama Calaga, Rossano Giachino, Delphine Jacquet, Lars Jensen, Verena Kain, Thibaut Lefevre, Alick Macpherson, Ryoichi Miyamoto, Laurette Ponce, Bruno Puccio, Adriana Rossi, Rogelio Tomas, Glenn Vanbavinckhove, Frank Zimmermann.

1- Comments – News – Follow-up

Controls infrastructure status report – Pierre Charrue – [Slides](#), not presented due to lack of time. Short summary:

- Analyzed the problem that blocked many sequencer tasks in the early hours of Sunday: a deadlock on the border between JAPC and CMW, involving threads from both libraries. It only occurs very rarely and under exceptional circumstances. Therefore, no rush for a solution, but will carefully seek the best place in the code to fix the problem
- XPOC data missing after the beams are dumped: experts from ABT, BI, CO searched their log files but no evidence has been found yet. Now wait for the next Beam Dump to follow the course of actions and the data flows. More news later...

2- LHC beam commissioning- Status and pending issues – Progress over the last week: Mike Lamont's [slides](#)

Discussion – Comments:

- Ralph Steinhagen: QTF/QTD: few 100 ms delay is now allocated to these circuits before triggering the EE switch.
- Massimiliano Ferro-Luzzi: ALICE & squeezing: decision pending
- In progress in the CCC at the time of the meeting: squeeze being done all the way to 2, 10, 2, 2 m (vs IR#). Beta beat measurements being done at each steps. Will be followed by loss maps and possible asynchronous dump tests as pre-qualifier for stable beams.
- Upcoming strategy, chronologically: Continued system commissioning and consolidation + Establish squeezed (beta* ~ 2 m) stable, safe beams + Probe higher intensities at injection + Operations consolidation + Preparation of increased intensity into stable beams

3- Feedback from experiments – Massimiliano Ferro-Luzzi ([slides](#))

To note:

- IP1 and 5 luminosity vs. squeeze: factor gained: 4-5

- Transverse position, in general, stable to $< 50 \mu\text{m}$ (ATLAS and CMS)
- BPMSW drift at IP8? Cooling of the crate seems to be the culprit, difficult to correct. But VELO using these info for monitoring of “safe beam conditions” - **to be followed-up**
- Large and sudden transverse beam motion at IP8 during stable beams (lost RCBV12.L4B1) – linked to FGC communication, leading to a jump in the orbit. Local access needed - **to be followed-up**
- Longitudinal jump: step in luminous region z-position observed by ATLAS and CMS in fill 1023 (~ 6mm)
- Filled bunches not always properly transmitted –due to procedure when filling (ticking pilot bunch). Could take the info – or cross-check- with BQM.
- Accel. Beam modes: **to be discussed**

4- Higher intensities – Requirements – What’s done? – What’s next?

Injection and beam dump systems – Brennan Goddard ([slides](#))

Full list of the work performed was presented, together with the upcoming work plan. See Brennan Goddard [presentation](#) for all details.

Discussion – Comments:

- Eva Barbara Holzer is preparing an ECR for updated BLM thresholds (in particular at Q3)
- Excellent beam lifetime with 11×10^{10} p, single bunch
- Injection looked very clean. Losses on TCDIs seem to go down with increasing intensity (PSB delivering cleaner beam?)
- Circulating beam emittance: no sign of increasing emittance with increasing intensity (below nominal in both emittances)
- Tune shifts in the e-log look suspect -to be checked more carefully next time, especially when spectra is on the hump
- Injection issues to follow-up: i) Injection losses as intensity increases: BLM thresholds, TCDI settings, SPS scrapers; ii) IQC data acquisition –in progress
- Very soon, interlocked BPM at P6 won’t be anymore makeable
- Abort gap keeper: prevent to inject into the abort gap- Different from abort gap cleaning
- TCDQ/TCDS: BLM threshold and saturation : potential issue
- Signal linking injection to extraction kickers: hardly feasible: HW commissioning would become very difficult – logics for the 2 systems are very different
- BCT readings missing during beam dump events: being followed-up with BI and CO.

Collimator systems – Ralph Assmann ([slides](#))

Ralph Assmann presented the collimator commissioning status and work plan. See Ralph Assmann [presentation](#) for all details.

Discussion – Comments:

- 0.2 sigma nominal is about 100- 200 μm – this margin is already eaten up by orbit effect from long-range beam-beam interaction
- Agreed weekly monitoring of collimation performance (“preventive setting maintenance”) could not be done, nor at 450 GeV or 3.5 TeV
- Set up of collimation at 3.5 TeV, injection optics and separated: Not done. Data will be the end point of collimators closure during ramp
- But situation today compatible with squeeze, stable beams and low intensity (for up to 100 kJ stored energy)

- For higher intensity: Redo the system setup following the systematic approach defined in the past. Ideally do this with next step in beam intensity (better accuracy, giving higher intensity reach for next setup)
- Proposed a collimation commissioning Program for < 100 kJ (2e11 p at 3.5 TeV) and for > 100 kJ up to ~ 0.5 MJ
- Proposed to delay the “ramp with collimation” set-up for high intensity. No consensus reached on this proposal, set up with one nominal bunch could be a compromise - will be discussed tomorrow at the next MPS meeting.

Machine Protection System – Jörg Wenninger ([slides](#), not presented due to lack of time)

Jörg Wenninger stressed that already 11 shifts are needed to complete all LBDS, injection, BLM, SIS, BIC studies to qualify the MPS for going above unsafe beam (> safe beam limit = 3e10).

5- What's next?

The strategy for increasing the intensity will be discussed this week and a proposal will be presented next week for approval. In the meantime, some pre-requisite work for increasing the intensity will be scheduled in this week LHC beam commissioning machine time.

A.O.B.

Daily 8:30 HWC meeting in the CCC conference room (09:00 at weekends).

Daily 17:00 Beam commissioning meeting /OP, CCC glass box.

Next meeting: 20 April 2010, 15:30, 874-1-01. Agenda will be sent in due time.

Malika Meddahi