

LHC-Beam Commissioning Working Group

Notes from the meeting held on
27 April 2010

Present: Carmen Alabau, Ralph Assmann, Wolfgang Bartmann, Helmut Burkhardt, Andy Butterworth, Chiara Bracco, Roderik Bruce, Pierre Charrue, Bernd Dehning, Laurent Deniau, Octavio Dominguez, Lene Drosdal, Massimiliano Ferro-Luzzi, Kajetan Fuchsberger, Brennan Goddard, Per Hagen, Delphine Jacquet, Lars Jensen, John Jowett, Mike Lamont, Yngue Levinsen, Alick Macpherson, Malika Meddahi, Giulia Papotti, Mario Pereira, Mirko Pojer, Bruno Puccio, Stefano Redaelli, Frank Schmidt, Rüdiger Schmidt, Andrzej Siemko, Katarina Sigerud, Matteo Solfaroli, Ralph Steinhagen, Marek Strzelczyk, Rogelio Tomas, Jan Uythoven, Glenn Vanbavinckhove, Walter Venturini Delsolaro, Jörg Wenninger, Simon White, Daniel Wollmann.

Excused: Reyes Alemany, Gianluigi Arduini, Tobias Baer, Roger Bailey, Oliver Bruening, Rama Calaga, Rossano Giachino, Massimo Giovannozzi, Wolfgang Hofle, E. Barbara Holzer, Verena Kain, Thibaut Lefevre, Gabriel Mueller, Laurette Ponce, Stefan Roesler Adriana Rossi, Elena Shaposhnikova, Ezio Todesco, Uli Wienands, Frank Zimmermann.

1- Follow-up – Issues – Mike Lamont ([slides](#))

Joerg Wenninger: concerning the hump, did we investigate on the collimator side, as they have motored which are all the time on? Ralph Assmann: But the signal is only seen in the vertical plane. If needed, the collimators can be all switched off for test at 450 GeV, pilot intensity. It must be taken into account that few hours will be needed for the recovery of the overall system.

Pierre Charrue: concerning the communication lost with Orbit Feedback Service Unit devices: CO is still monitoring his FESA servers and his ProLiant machines, waiting for the next communication issue to happen → since then, no errors.

Marek Strzelczyk: The hysteresis cycle was not taken into account properly for the inner triplets: discrepancy of 13 units. See Rogelio Tomas presentation for further analysis.

2- LHC beam Commissioning – List of issues and follow-ups ([slides](#))

Mike Lamont reminded the beam commissioning progress done since the LHC start-up on the 27th February and congratulated all colleagues for the excellent achievements made all along the last 2 months.

Follow-ups ([slides](#)):

- Q': still running at 4 in Physics. **Should be lowered down to 2**
- Actual trims: **new version ready to be tested**, already in the CCM menu. To be tried.
- ATLAS prefers to go back to a bunch filling where there is no parasitic encounter
- **Squeeze mode** to be put in the sequencer
- Stable beams with beam permits unlinked? Mostly Post Mortem and XPOC issues! **Should perform the link between the beams as soon as we start the ramp**. And unlink the beams only when going into machine development to not loss both beams.
- Strategy for limiting ALICE luminosity to be defined
- An even more stable sequencer is needed
- Chromaticity measurements can be run through the tune feedback: tbd

- Beta beat measurements through the ramp to be done: tbd
- Orbit feedback and feed-forward: tbd
- Collimator setting-up : injection – ramp – squeeze - tbd
- Move to 10 A/s - tbd
- Abort gap cleaning - tbd
- Experiment list of wishes was presented (see Mike' slides) – tbc

Increase in intensity: presentation at the LHC-MAC by Joerg Wenninger ([slides](#)). Will be discussed tomorrow at the restricted MPP meeting.

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

Brennan Goddard presented the status of the work which has already been done on the injection and beam dumping systems.

To-do list for the Transfer lines, injection and dump systems:

- Revisit TL trajectories and check 'golden' with new injection steering
- Detailed measurement of dispersion matching into LHC
- Optics measurements for coupling term at injection
- Aperture measurements of a few phases for TI 2
- Finish injection protection setting up
- Detailed setup of TCDIs (B2 only)
- Higher intensity injection made 'operational' - Thresholds for adjacent BLMs
- Multibunch injection (what, and for when?) - SPS scraping studies
- Measurement of B1 MKI waveform
- Fine adjustment of MKI kick lengths
- Verification of injection aperture through MSI with 'golden' trajectory and 'orbit'
- Study of injection matching and emittance preservation
- Finish tests without Beam - e.g. system 'off' with beam, TCDQ, ...
- Checks of new MSD transfer function - Dry ramps and one dump at 3.5 TeV
- Finish systematic P6 aperture measurements
- Finish remaining LBDS MPS checks (450 GeV pilot)- e.g. Abort gap keeper, MSD FMCM, RF freq. intllk., 1 MKD knob,...
- Abort gap monitor and cleaning studies
- Continue tests of asynch dump protection, with collimation
- TCDQ interlocking i) Full deployment and checks of synchronised collimator/TCDQ movements and interlocking- ii) SIS orbit/TCDQ intlk (JW)

Potential known issues:

- Injection losses from TCDIs on LHC BLMs
- Thresholds being raised in some places
- Large factor (~100) needed
- Occasional flakey injection – even with $1e10$
- BLM saturation for 1 turn losses - hurts analysis
- Vacuum activity on MKI after 3.5 TeV coast – to survey
- Some continuing controls/DAQ issues
- Loss levels on TCTs after asynch dump
- TCT damage limits are low

4- Collimators – Ralph Assmann ([slides](#))

IR6 dump protection: losses are too high – To understand - Revisit the TCSG/TCDQ positions. Also take into account that we are looking at raw beam loss monitors.

Measurements and simulation cleaning at 3.5 TeV agrees very well.

Work on going on the measured half gaps vs. the expected half gaps with the nominal betas at IR7: some discrepancies to understand.

To-do list:

- Wait for 1-2e11 p at 450 GeV
- Determine n1 → required collimator settings (1 shift)
- Set up 450 GeV again, impedance check (2 shifts)
- Generate ramp settings (2 days)
- Ramp with collimators closing (2-3 ramps)
- Higher intensity at 3.5 TeV: Set-up 3.5 TeV separated
- Then set up for squeeze collimator functions separated
- Then set up for collapse of separation bump

5- Optics measurements – Rogelio Tomas ([slides](#))

Rogelio Tomas presented the optics measurements performed.

Reproducibility at 3.5 TeV, 2m optics shows that the horizontal beta beat gets better as the vertical one gets slightly worse (10% variation observed).

A local correction in IR2 seems to correct the beta beat error. Correction was not implemented.

IP8 correction was very effective. Marek Strzelczyk provided the information on the errors in the triplet (hysteresis cycle not taken into account properly). This would give 13 units in the inner triplet. It does reproduce the shape of the observed errors in IP8, but is a factor 2-3- still too small.

IP1: local correction of the coupling is absolutely mandatory (global correction is not enough).

What's next?

- Reproducibility: More measurements needed
- IR8:
 - Update MQXB2 calibration and reduce Q5R8 correction to -330 units.
 - Re-measure and verify/re-compute correction (~3 hours)
- Investigate IR2
- Compute IR1 corrections
- Implement and measure IR1&IR2 corrections (~2 hours)
- Fine tuning of coupling

Joerg Wenninger: Need AC dipole for these measurements: so need safe beams.

Ralph Assmann – Brennan Goddard: After each optics change, must re-qualify again the machine protection devices and re-perform validation tests.

6- What's next? – Malika Meddahi ([slides](#))

A proposal concerning the LHC beam commissioning planning for the next 2 weeks was presented for discussion.

Ralph Assmann said that the setting up of the collimator at 3.5 TeV, with separation bumps, should be done when higher intensity is achieved.

Brennan Goddard said that over injection is indeed ready to be used in operation.

Massimiliano Ferro Luzzi confirmed that the 450 GeV collisions should provide 10 million inelastic events.

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: **4 May 2010**, 15:30, 874-1-01. Agenda will be sent in due time.

Malika Meddahi