

LHC-Beam Commissioning Working Group

Notes from the meeting held on 8 September 2009

Present: Reyes Alemany, Ralph Assmann, Oliver Brüning, Helmut Burkhardt, Massimiliano Ferro-Luzzi, Massimo Giovannozzi, Eugenia Hatziangeli, Werner Herr, Bernhard Holzer, Hitomi Ikeda, Lars Jensen, John Jowett, Mike Lamont (chair), Malika Meddahi, Gabriel Mueller, Mario Pereira, Bruno Puccio, Mirko Pojer, Stefano Redaelli, Stefan Roesler, Jan Uythoven, Ralph Steinhagen.

Excused: Gianluigi Arduini, Brennan Goddard, Verena Kain.

1. Comments and actions from the last minutes

None.

2. News from LMC – Mike Lamont

No LMC meeting last week. Summary notes from previous LMC meetings, written by Brennan Goddard or Frank Zimmermann, are available [here](#).

3. Dry Run news – Reyes Alemany (slides)

Week 36:

- Settings generation for 3.5 TeV
 - Ramp done
 - Squeeze work on going
 - There has been a change on strategy: before the crossing angle and the separation were integrated in the settings, now they are decoupled and converted into knobs.
- Incorporation: the incorporation function to function is not yet available, so postpone to next week.
- RF follow-up: RF logging now working.
- Virtual critical settings: still some issues at the level of the software implementation; postpone to next week.
- Energy cycling for abort gap monitor done.

Week 37:

- Dry run of the Transverse Damper as a damper and abort gap cleaner: applications, parameter space, settings, sequences, logging
- Dry run of the Abort Gap Monitor: application, logging, critical settings, trim, XPOC, alarms
- Hardware group categories: OP has asked to add categories to the hardware groups to try to rationalize their use and maintenance. The categories are: OPERATIONAL, DEVELOPMENT and SOC. This implies a modification in the database and in the application (equip state) that has to be tested.

Plans for Week 38:

- LHC RF for ions,
- re-phasing with injection kickers?
- SIS task for IQC
- Hardware groups and PC settings follow up
- Transverse damper/Abort gap cleaning follow up from week 37

4. 3.5 TeV parameter list – Werner Herr

The optical parameters, i.e. minimum β^* of 2 m presented by Mike at the [LHC Beam Commissioning meeting on 25th August](#), ([Mike's table](#)) are in agreement with ABP estimates. At 3.5 TeV they can be operated with the nominal (i.e. 140 - 150 μ rad) crossing angle inside the available aperture.

Ralph Assmann: Intermediate collimator settings can only be used for n_1 kept at around 11.3 (n_1 goes below 11.3 between 3 and 2 m (at 2m, n_1 is down to about 10.5). Below that, tight collimator settings should be used. Experience during operation will allow probing the theoretical values and if needed update them. Would be important to add for all scenari the values of n_1 , obtained from MADX.

Oliver Brüning: Why not choosing from the start a value of β^* which could be kept the same (between 2 and 3m)?

Stefano Redaelli: Do we need to use the pre-squeeze optics at the beginning of the commissioning period? – normally not required below 6.3 TeV. Mike Lamont: it is decided to NOT use the pre-squeeze at the beginning of this run.

How to perform the IR squeeze: eventually will try to do all IRs at the same time. Werner Herr: should start will individual squeeze, IR by IR.

For energies lower than 5 TeV the luminosity suffers due to larger emittance and the required larger β^* while at the same time the stored energy in the beam is significantly reduced. Higher luminosity can only be reached by increasing the bunch intensity and approaching the nominal value around 10^{11} per bunch (see Mike's table). This implies basically nominal head-on beam-beam effects. These issues may be an incentive to go to more bunches, i.e. with crossing angles, already at 3.5 TeV, but lower bunch intensity.

Even for max. 156 bunches, it may be considered operating part time with the nominal crossing angle, e.g. at the end of a fill, to get experience for the operation and settings such as collimators etc. For the optical functions foreseen the geometrical luminosity loss is very small and should not be an issue.

Massimo Giovannozzi: Longitudinal beam parameters will be provided by Elena Shaposhnikova and will be added to the list of parameters – should not be too different to the 5 TeV ones.

Werner Herr: Head-on bb effects will be the first limiting factor if the beams are not matched (emittance different from bunch-to-bunch).

All pile-up values shown in Mike tables are O.K. with the experiments.

Luminosity measurements systems: status to be reported in an upcoming LHC Beam Comm. meeting.

5. Preliminary input for the 2009-2010 strategy – Massimiliano Ferro-Luzzi

Massimiliano presented first inputs gathered in brainstorming meetings.

Contents: Experiment's features and requests (informal), filling schemes, run scenario. Transparencies are not attached to these minutes, as the contents will be discussed and approved at the LPC meeting on 14th September. More formal presentation at the LMC to come.

All experiment requests:

- Magnetic fields to be ON as quickly as possible, and as machine commissioning allows, and if ON should be to the full nominal field corresponding to 7 TeV/beam, even if beam energy is as low as 450 GeV;
- Beam interlocks: test with beam;
- VdMeer scans: test very early on (1st coll) and use on a regular basis.

ATLAS and CMS requests:

- Take a minimum amount of data at 3.5 TeV/ beam;
- Move to 5 TeV as soon as considered safe;
- Polarities:?
- Heavy Ions: beam conditions as in IP2? To be discussed...
- ALFA? Hardware not in place?

ALICE requests:

- Would like to run in *two pp* modes;
 - Flip B_{spectr} on regular basis, if possible;
 - First HI run: use same magnetic machine for ions as for last proton run;
- + Special requests:
- Possibility to add a few special bunches in all filling schemes that would collide at IP2 (and not the other bunches). Proposal and consequences, incl. beam instrumentation to be further evaluated.

LHCb requests:

- Move to crossing angle on as quickly as possible;
- Flip $B_{\text{spec.}}$ on regular basis, if possible;
- Larger beams (at identical lumi and pile-up) are better.

LHCf requests:

- Keep exposure $< \sim 10$ Gy;
- To minimize exposure, detector is IN (OUT) when (NO) stable beams;
- Take data at all used beam energies;
- Take data with crossing angle;
- take data at a few intermediate vertical positions;
- Also take some HI data.

Impact and consequences to be discussed and evaluated. Estimate to change the detector to be given.

TOTEM requests:

- Move in RPs to 15σ (early on) then 10σ ;
- 90 m optics asap;
- Km optics for full physics program (>2010).

Impact and consequences to be evaluated.

More requests:

Interest of shifting injection of PS batches into SPS to optimize the LHC filling scheme: to be investigated.

A note describing the 2009-2010 run targets is being written, assuming a baseline plan, with text explaining caveats and alternative scenari. Note out by mid-end October.

Set of conditions to increase the energy from 3.5 TeV to 5 TeV to be clarified. Follow-up: Mike Lamont.

Mike Lamont: Detailed LHC beam commissioning schedule is in progress.

Next meeting

Tuesday 22nd September 2009, 15:30, 874-1-011. Agenda will be sent in due time. Please note that there will be **NO meeting on 15 September**.

Malika Meddahi.