

LHC-Beam Commissioning Working Group

Notes from the meeting held on
21 April 2009

Present: Reyes Alemany, Roger Bailey, Oliver Brüning, Helmut Burkhardt, Pierre Charrue, Stephane Fartoukh, Massimiliano Ferro, Kajetan Fuchsberger, Rossano Giachino, Massimo Giovannozzi, Brennan Goddard, Magali Gruwé, Hitomi Ikeda, Delphine Jacquet, Lars Jensen, Verena Kain, Christoph Kurfürst, Mike Lamont (chair), Alick MacPherson, Malika Meddahi, Gabriel Mueller, Annika Nordt, Bruno Puccio, Mirko Pojer, Laurette Ponce, Stefano Redaelli, Frank Schmidt, Matteo Solfaroli, Ralph Steinhagen, Marek Strzelczyk, Jan Uythoven, Walter Venturini Delsolaro, Antonio Vergara, Helmut Vincke, Jörg Wenninger, Simon White, Marco Zanetti.

Excused: Eugenia Hatziangeli.

1. Follow-up from the last minutes

- Date for the tests with RBAC on strict mode - Pierre Charrue
P. Charrue said that if RBAC is used on strict mode for the TI 8 June tests, it has to be tested one week before, on Tuesday 26 May, implying that all equipment groups and applications should be ready -access maps on the front ends are required. However TI applications are mostly managed through the SPS control system, not the LHC one. J. Wenninger added that all the interlocks are already access protected.
Decisions:
 - It was agreed that RBAC on strict mode should only be used for the LHC. Date for RBAC on strict mode for the LHC only to be announced in the future: **M. Lamont**.
 - Applications and devices used for the beam tests: Compile list and send to P. Charrue: **V. Kain**
- LHC MSI and MDS control system - B. Goddard ([slide](#))
Presently the MSI are on mugefs and the MSD on FGCs. Brennan proposed to move the MSI to the FGC control and either add current (function) interlocking to FGCs (could maybe be done before the start-up but would be tight) or add MSI current (1 value) into the injection BETS (but cannot be done for this start-up). If no other candidates for HW interlocking currents are found, and if the resolution / accuracy are sufficient, the second option is simplest and will be implemented for the 2011 start-up.
- Investigation on the aperture limitation in Q1R5-Q2AR5 - S. Fartoukh, ([pictures](#)).
The summary of the explanation of S. Fartoukh are taken from his comments to the NC report 993108: After clarification with N. Kos, the object is in the interconnect of Q1-Q2a, on the right of IP5, in the lower flat side of the beam-screen and on the right side with the ring center on the left. Assuming 3 mm for the height of this object, the impact on aperture is NOT negligible and imposes some operational constraints.
More quantitatively, the impact on the normalised aperture of beam2 is acceptable of the order of $dn1 \sim 0.5$ (reduced from ~ 8.5 to 8 both at 450 and 7 TeV) due to the

fact that the beam2 aperture limitation is essentially in the horizontal plane at the exit of Q1 (Q1.R5 is focusing vertically for beam2). For beam1 the situation is quite different. Assuming 3 mm for the height of the object, n_1 drops down to $n_1 \sim 5.8-6.3$ at injection and in pre-collision (i.e. with the parallel separation ON) in a worst case scenario related to the sign of the parallel separation: $y^*_b1 < 0$ and $y^*_b2 > 0$. The target $n_1=7$ is then recovered if the size of the object is only of the order of 1.5 mm. Since the size of this object is delicate to quantify with good precision, it means that we will lose our flexibility concerning the sign of the vertical parallel separation in IR5, i.e. to always choose $y^*_b1 > 0$ and $y^*_b2 < 0$. In addition, this aperture limitation will prevent us to do sizeable negative vertical adjustment of the vertex in collision (for a β^* of 55cm) if required by the experiment, e.g. to compensate for any vertical movement of the CMS cavern.

Decision: Object will be left there - change of beam screen not possible at this stage! But it should be checked that the vertical offset (parallel separation) at the IP5 is indeed positive.

- Highlights from the last LMC minutes held on 15 April: M. Lamont
Summary notes of the [minutes](#) (B. Goddard)
Any inputs on the number / frequency / dates of future LHC technical stops **to be sent to M. Lamont** before 29 April (item on the 29 April LMC agenda).

2. Optimisation of the collapsing time of the separation bumps and foreseen MCBX ramping tests (S. White)

S. White presented the optimisation done for the collapsing time of the separation bumps and the May upcoming ramping tests. ([slides](#)). Simon reminded that the time to bring the beams into collision is given by the slowest magnet. For IP2 and IP8 this time is about 10s. A test of the ramping of the magnets will be performed, including all the magnet concerned, with the aim to measure the performance of the correctors involved in the LHC crossing scheme and to determine an optimal configuration and the system flexibility.

MCBX are special nested magnets acting at the same time on both planes and beams. MCBC and MCBY allow to independently control the two beams in the horizontal and vertical plane and are also used for the orbit corrections and optimisation.

Proposal for the MCB tests:

1. Ramp up from I_{min} to I_{max} and back to I_{min} . Find maximum / optimum acceleration / ramping rate;
2. Repeat for different values of I_{max} and I_{min} ;
3. Test planes separately and with the other plane powered to the intensity required for the crossing angle;
4. Test settings corresponding to the four IPs.

In parallel, separation knobs will be used for different optics configurations and tests. The software to be used during the tests is to be determined.

Conclusion:

It was possible to reduce the time to bring the beams into collisions by retuning the separation bumps. A test is foreseen to check the hardware performance. The relevant powering tables and a detailed description for the tests still need to be provided.

3. Dry Run News (V. Kain)

Much work has been done during the scheduled dry runs ([slides](#))

- Summary of Week 14 results (BI, MKI...):
<https://espace.cern.ch/mddb/Activity%20Tracking%20Tool/Activity%20Tracking%20Welcome.aspx?View=%7b593B6E53-F6F9-4485-8646-E7E683D0F681%7d&FolderCTID=0x012001&SelectedID=19>

BTVST not in optics and TI8.BTVI.87750 defined as TI8.BTVI.87751. **M. Meddahi**

- MCS tests: summary under <http://vkain.web.cern.ch/vkain/MCSTests.htm>
- FGCs tests. Summary under <https://espace.cern.ch/mddb/Activity%20Tracking%20Tool/Activity%20Tracking%20Welcome.aspx?View=%7b593B6E53%2dF6F9%2d4485%2d8646%2dE7E683D0F681%7d&FolderCTID=0x012001&SelectedID=28>
- Week 17: to be tested: injection systems (kicker will be pulsed in point 8, transfer line power line...), beam dump lines and timing (new telegram ready).
- Week 21 (extraction tests TT40 and TT60): some dry run will be done at that time in the LHC.

Mike Lamont congratulated the dry run team for the very good work and nice progress.

4. New beam tests and preparation for the Transfer Lines tests (R. Giachino)

Rossano Giachino presented the LHC beam tests planned in 2009. ([slides](#))

To note: TI 2 test is now planned 11 / 12 July and reserved TL beam test on 15 / 16 August. J. Wenninger mentioned that on 15 / 16 August most of the experts will be absent.

Decision:

- **TI 2 test is scheduled on 11 / 12 July;**
- **New reserved date for the TL tests: 22 / 23 August.**

Rossano presented the detailed preparation planning for the beam test, including the DSO tests.

For the 6 / 7 June tests:

- Friday 29 May: DSO tests;
- Friday 5 June, midday: Patrol and closure of the tunnels;
- Saturday 6 -7 June: TL beam tests;
- Monday 8 June: radiation survey needed before re-opening.

Concerning RP issues linked to the tests, Helmut Vincke clarified that they will depend on the intensities which are sent down to the areas and the work foreseen in the areas of concern after the tests.

To send total intensity and list of tests to be done: **Brennan Goddard** to Helmut Vincke.

5. A.O.B

None.

Next meeting

Tuesday 28 April 2009, 15:00, 874-1-011. Agenda will be sent in due time.

Malika Meddahi