

## LHC-Beam Commissioning Working Group

Notes from the meeting held on  
**16 February 2010**

Present: Carmen Alabau, Reyes Alemany, Ralph Assmann, Helmut Burkhardt, Chiara Bracco, Roderik Bruce, Rama Calaga, Paola Catapano, Ed Ciapala, Laurent Deniau, Lene Drosdal, Massimilano Ferro-Luzzi, Rossano Giachino, Massimo Giovannozzi, Brennan Goddard, Per Hagen, Eugenia Hatzangeli, Eva Barbara Holzer, Lars Jensen, Mike Lamont (chair), Alick Macpherson, Malika Meddahi, Gabriel Müller, Mario Pereira, Bruno Puccio, Stefan Roesler, Adriana Rossi, Frank Schmidt, Marek Strzelczyk, Ralph Steinhagen, Ezio Todesco, Rogelio Tomas, Jan Uythoven, Simon White, Uli Wienands, Daniel Wollmann.

Excused: Gianluigi Arduini, Philippe Baudrengien, John Jowett, Verena Kain, Giulia Papotti, Stefano Redaelli.

Mike Lamont welcomes Paola Catapano, DG/CO. She will be regularly attending the LHC Beam Commissioning meetings, in preparation of the [Media Day](#), which will take place for the 1<sup>st</sup> 3.5 TeV collisions. Before this event, footage will be made as support during the 3.5 TeV Media Day. As usual, volunteers are highly appreciated.

### 1. Comments and follow-up from previous minutes

Markus Zerlauth has proposed a simplified procedure for the LHC access by limiting the current in the LHC circuits during short expert interventions ([DRAFT functional specifications](#)). The “Proposal for SW Interlock supporting applying the agreed access procedure for 2010” will be discussed at the LMC on 20<sup>th</sup> February ([Draft presentation](#)). Any comments to be directly sent to Markus Zerlauth.

### 2. HWC progress and readiness of the LHC systems – Mike Lamont on behalf of the HWC team ([slides](#))

#### General issues:

##### Point 8:

- Transformer for general services to be repaired, about 2 days stop for sector 78 and 81, needs to be done before beam operation (possibly Wed-Thu this week)
- X-ray in 8R. No access in UJ87 between 10:00-13:00
- Patrol. No access in the whole point 8 between 16:00-17:00

Sector 81: switch UPS off, to verify that 8 kHz comes from this system – Wed. at 14:00

##### Point 2:

- TI2 DSO tests to be repeated on Wednesday. No powering in 12, 23, 34 and no access in point 2.

Point 6: Generator for LBDS to be replaced (1 day + 2\*several hours).

Detailed progress report was given, sector by sector (see [slides](#)).

Ed Ciapala: RF would like a 2-hour slot, tomorrow, on Wednesday afternoon to test part of the Beam Control. This intervention will disrupt the RF clocks (Exp, BT, BI,...). Noted and accepted.

From Rüdiger Schmidt: No beam in the LHC before Monday 22 February. This is the earliest possible date; Beam injection into the LHC might therefore only be available on Wednesday 24 February, given the check-out preparation tasks to be performed.

It is proposed to schedule the LHC access needed to re-enable all BIC channels, connect the BETS and connect the LBDS to the LASS on Monday 22 February. An up-to-date confirmation will be given at the end of this week, pending HWC progress.

Ed Ciapala reminded that a huge amount of work is still to be done for RF, and, if no beam is available before mid-next week, time can be used for RF work.

### 3. Dry run news – Reyes Alemany

As always the overall progress is available in the tracking pages:

<https://espace.cern.ch/mddb/Activity%20Tracking%20Tool/Activity%20Tracking%20Welcome.aspx?View={593B6E53-F6F9-4485-8646-E7E683D0F681}&SelectedID=65>

This week is devoted to dry run of RF system and of the interface to the experiments, e.g. handshakes, BIC, Experiments interlocks, and experiments fixed displays. All other issues are being followed-up as well. If extra days of dry runs are indeed available, work can also continue on the dry run concerning the injection systems.

Brennan Goddard gave the latest news on the MKIs: following the opening of valves around MKI2 & MKI8, the MKI2 kickers were conditioned early this afternoon. MKI8 kicker system could not be pulsed. It is thought that a "timing switch" may have been left in the incorrect position (local timing) in the UA – will be investigated Wednesday morning. Once the problem is rectified the kickers at Point 8 will be conditioned via an extended SoftStart. Adriana Rossi added that one transfer line collimator –TCDIV- is not commissioned yet. It concerns the one which has been re-installed during the last shutdown. The problem seems to be linked to the control application: being checked. *Added after the meeting: Stefano Redaelli: There is no issue and everything was configured properly for the new layout name, simply the version is not yet available as PRO because we always test new versions as NEXT before deploying them. On 17 Feb. we also performed the machine protection tests and all looked ok. On 18 Feb. I will check with Alessandro Massi to see if it is ok for beam tests.*

Alick Macpherson: Vacuum valve interlock tests have been done for all LSS sections of the machine except for LSS5. LSS5 will be done on Wednesday at the earliest. After the valve interlock tests, all valves were closed (with the exception of the valves around the MKIs) and should remain closed until just before beam. All valves in the LHC have been unblocked, and the responsibility for their manipulation has now been handed over to OP. The only exception to this is the valves at CMS which remain under vacuum group responsibility until after the pump out of neon from the CMS beam pipe.

### 4- Field model issues, precycle and beta beating - Ezio Todesco (slides)

Ezio Todesco reminded that the following magnets have not been precycled in 2009: the block of 6 MQTL around IR3 and IR7 in Q6 and the spectrometer compensators (6 magnets). Both families will be precycled in 2010.

In addition, it has been recently found by Per Hagen that a few magnets had a precycle whose minimum current was not low enough to recover the ascending branch of the hysteresis at injection.

First case: MQWA – the precycle goes down to 35.1 A and we inject at 35.3/38.3 A. At 35A the hysteresis gives a +4% error between the model and the actual magnet. This fits with what was guessed by Rogelio Tomas on the ground of beta beating measurements.

Second case: MQXA – the precycle goes down to 400 A and we inject at 408 A in IR1 and IR5 but at 452 A in IR2 and IR8 – should be better. At 400 A the hysteresis gives a -0.4% error between the model and the actual magnet (30 units) in IR1 and IR5.

Third case: MQXB – the precycle goes down to 700 A and we inject at 708 A in IR1 and IR5. But at 776 A in IR2 and IR8 – should be better. At 700 A the hysteresis gives a -0.6% error between the model and the actual magnet (60 units) in IR1 and IR5.

Fourth case: MBW – the precycle goes down to 41.1 and we inject at 40.9A

Fifth case: MBRC – injection 80 A above in IP1 and IP5. Probably the effect is not strong (less than 10 units?) – To be checked

In all cases, the minimum precycle current will be lowered (**Action: Mike Lamont and Ezio Todesco**).

Second issue: In 2009, the precycles for bipolar magnets have been implemented always as up-down to be on the ascending branch: indeed, some magnets with dipolar power converter belong to the optics and have negative current settings (some MQTL and MQWB). These magnets have been on the wrong hysteresis branch in 2009, and this could be an additional source of beta beating?

Concerning the MQTL, they have a very low residual magnetization. It is not modelled in FiDel. Therefore this issue is not relevant, and Ezio Todesco proposes to not take any action.

Concerning the MQWB, they have a non negligible residual magnetization. A down-up precycle will be implemented by **Mike Lamont** for those magnets with negative current settings.

#### Summary:

- MQWA: magnets were on the wrong branch of the hysteresis due to a precycle minimum current larger than injection current (+4% error)
- MQXA in IP1 and IP5: magnets were on the wrong branch of the hysteresis due to a precycle minimum current larger than injection current (-0.4% error)
- MQXB in IP1 and IP5: magnets were on the wrong branch of the hysteresis due to a precycle minimum current larger than injection current (-0.6% error)
- The block of 6 MQTL around IR3 and IR7 in Q6 has not been cycled – effect should be negligible
- MQWB: half of them are on the wrong branch of the hysteresis since they have negative settings (error to be estimated - is it relevant?)
- MQTL: half of them are on the wrong branch of the hysteresis since they have negative settings (should be negligible)
- Tune drift during ramp
  - The error in the transfer function of the MQWA (+4%), and in IR1 and IR5 MQXA (-0.4%) and MQXB (-0.6%) is present only at injection
  - Disappears during the ramp, where the right branch is recovered
    - What is the impact on the tune?
    - Is it related to the observed tune drift?

With these changes the machine could be considerably different from 2009, both in terms of tune trims and beta beating.

#### 5- Preparation for the injection test and for the LHC beam re-start

Rossano Giachino: SPS-LHC beam ready, RF optimisation is going on. Beam successfully extracted on the TT40-TED. Heating tests done in the transfer lines. All systems are ready for the transfer line beam tests.

Malika Meddahi showed the preliminary plan for the transfer line tests ([slide](#)). The tests will take place from THURSDAY 18 February, 22:00 to FRIDAY 19 February 06:00. The planning is challenging and only a limited number of measurements, out of the presented list, will be performed in the available time.

Mike Lamont presented a first draft of the LHC beam commissioning schedule, shift by shift, for the LHC beam commissioning re-start. ([slides](#))

Comments:

- All magnets (solenoids and dipoles) off until hump investigated. But they will then be brought up early in the commissioning phase.
- Investigate this hump as early as possible.
- Separation bumps on as of day 4.
- Beta beating must be measured AND corrected before any detailed aperture measurements or collimator setting up.
- Aperture checks: to be done only at places either not measured or where the measurements are questionable or where changes have been made. Most probably to be redone in general... Should be established in terms of n1. Would need emittance controlled first, injection properly set-up and orbit under control.
- Before collisions at 450 GeV, more checks of the collimators, injection and dump systems are needed. A phase of pre-collision preparation must be added in the programme.

List of follow-up actions for the LHC beam preparation is available [here](#). Daily progress will be discussed at the daily 17:00 meeting.

Comments:

Ralph Assmann: Unexpected losses in IR3: Survey re-checked, nothing seen. Looked closely at the data: problem identified as being most probably noise. BLM team is looking at the data.

Brennan Goddard: losses in IP8 is issue of overinjecting onto TDI. General issue of beam losses at injection needs detailed investigation, including TCDIs and SPS scrapers.

Ezio Todesco: New b3 measurements available. Will report next week.

Ralph Steinhagen: Chromaticity measurement: user-friendly click to be done from the application.

Alick Macpherson: Logging DIP data: in progress (experiment background, luminosity, etc will be logged)

Mario Pereira: Run control interface: A table needs to be changed. It exists but was never used.

Mario Pereira: Trim interface: must discuss if a new version should be released, deployed and tested next week.

Marek Strzelczyk: Hysteresis: tested. More dry run time needed for squeeze tests.

Reyes Alemany: New version of the sequencer has been released. Not including the new GUI version. Will be done in the coming days.

Ezio Todesco: No changes on the powering history. Small subsets of parameters have been updated. Not yet in LSA.

Marek Strzelczyk: B2 in LSA: in progress.

*Added after the meeting: Pierre Charrue:*

**Proxies**

*Once the new version of proxies was recompiled for SLC5 last Monday, we see no instabilities.*

*A problem that appeared after the deployment of the new proxies: There are several applications that were installed before the new proxy was put in place and these applications still use the old configuration. For this reason there is a mix of traffic and equipment specialists are puzzled when they see client connections that are different from what they have asked for. o will eventually provide a tool for the application developers to see and verify their current proxy configuration.*

**Logging**

*The proxy server has only been used by the logging in production since Thursday 11th of February in the evening.*

*Since then:*

- *there are no errors explicitly coming from a proxy.*
- *We have not seen any instability problem yet*

*Note that: not all the devices that are using the proxies are publishing yet, and we steadily log data from some devices that are behind a proxy.*

## **JMS**

*Architectural changes:*

*The central JMS service JMS-CO-PRO serving TN clients has been deployed on the latest machine generation (16 Core) mid of January 2010*

*This old single broker instance has then been replaced with a two instance failover cluster. The single broker instance serving GPN (JMS-PUBLIC-PRO) stays on the old machine and – unless prohibited- makes ALL data from JMS-CO-PRO available.*

*Virtual machines and windows terminal clients now only connect to the PUBLIC broker to reduce furthermore the load on the JMS-CO-PRO service.*

*The BLM data is now served by a dedicated broker instance sharing the same machine as the JMS-CO-PRO service.*

*ProactiveChanges:*

*We've decided to provide our own ActiveMQ client library, which prohibits sending large data sets (i.e. 20MB message payload) in order to protect brokers from unexpected load. Users of the JMS service are informed about the architectural changes and reminded of the limits/restrictions.*

*Apart from the changes listed above we have implemented monitoring of the brokers via DIAMON notification via mail or sms in case of failure.*

*In summary for JMS: This new setup runs since mid of January without any interventions.*

## 6. A.O.B

**Daily 8:30 HWC meeting in the CCC conference room.**

**Daily 17:00 machine check-out meeting, CCC glass box.**

Next meeting: **23 February 2010**, 15:30, 874-1-01. Agenda will be sent in due time.

Malika Meddahi.