

LHC-Beam Commissioning Working Group

Notes from the meeting held on
19 May 2009

Present: Reyes Alemany, Helmut Burkhardt, Andy Butterworth, Stephane Fartoukh, Massimiliano Ferro-Luzzi, Eugenia Hatziangeli, Christoph Hessler, Rossano Giachino, Massimo Giovannozzi, Brennan Goddard, Verena Kain, Mike Lamont (chair), Alick MacPherson, Malika Meddahi, Mirko Pojer, Stefano Redaelli, Frank Schmidt, Ralph Steinhagen, Benjamin Todd, Jan Uythoven, Walter Venturini Delsolaro, Jörg Wenninger, Frank Zimmermann.

Excused: Gianluigi Arduini, Oliver Brüning, Laurent Deniau, Marek Strzelczyk, Helmut Vincke.

1. Follow-up from the last minutes

- Date for RBAC on strict mode for the LHC only: Reyes Alemany first confirmed that the Transfer Lines will not be put on RBAC strict mode. On 26 May a dry run will concentrate on operational modes and on learning how to assign user names to the piquet roles. On 15 July another dry run will be organised to test the LHC in strict mode. Therefore, at that moment all equipment must have implemented access maps with minimum requirements. Possible ways and / or procedures to check equipment after e.g. class updates must be proposed (for example with the addition of designated consoles in SR4 for RF purposes?). Potential RBAC issues and possible solutions / strategies for testing new release: **Follow-up: Grzegorz Kruk**
- Name of BTVI.8775*: Malika Meddahi confirmed that after the extraction of the new T1 8 sequence from the data base, this device appears now with the name BTVI.87752 and therefore the name is to be updated in the applications.
- Post-generation sanity checks will be done before beam tests: they will aim to reconstruct from the currents –and Ks- (Fidel group) the beta functions and separation & crossing bumps (OM)... **Follow-up: Fidel group (Walter Venturini Delsolaro) and OM (Frank Schmidt and Stefano Redaelli)**. On-going.
- During the squeeze, some magnets for IR 1, 2, 5 will change the sign of the current ramp, therefore the sign of the magnetization component for their transfer functions must be flipped in LSA. Email from Marek on 15 May: he has a rough idea of how to implement this feature in LSA without changing drastically the approach which uses calibration curves and introducing unnecessary complications. Some time is needed to check the feasibility of this approach. **Follow-up: Marek Strzelczyk**.

2. News from LMC (Mike Lamont)

Some subjects of the meeting held on 13 May (minutes from Frank Zimmermann will be available [here](#)):

- Dipole joints checked for all 4 warm sectors, few outliers found. Plan to collect more data to arrive to a clearer picture. Measuring the cold remaining sectors is in progress (very stable cryo required). Current restriction: 6-7 kA in upcoming LHC run?
- Quenching bus bars: simulation to be performed, WG formed;
- Speeding the powering tests considered;

- Start beam commissioning before hardware commissioning is finished? Consensus of LHC Beam Commissioning WG against divided the hardware tests in periods but on the contrary to stay focus on hardware checks until completion before injecting beam;
- Running LHC over Christmas period: ATLAS is in favour, the other three experiments would accept to run if LHC operates. The view of the accelerator complex will be presented by Mike Lamont at the LMC meeting on 20 May. Any more inputs to be sent to Mike Lamont.

3. Dry Run week 19 (Verena Kain, Alick MacPherson)

Ryes Alemany has developed a WEB page providing the status of the various systems <https://espace.cern.ch/mddb/Systems%20Dry%20Run%20Tests/Home.aspx>

Much work has been done by the dry run team and a complete status of all the checks was given by Verena Kain ([slides](#)).

Alick MacPherson presented tests performed on the circuit settings for various beam processes (precycle, ramp and squeeze for matching sections, ramp). A pragmatic approach was taken by cycling all available circuits in simulation mode and observing which circuits had issues. The purpose was to verify the settings for all available circuits to collect the list of problematic circuits, to update / check SOCs for ensuring that all required circuits are included and to understand standard procedure for updating SOCs and hardware groups. Full report to be read in Alick's [presentation](#), together with the BCTs status.

Stephane Fartoukh added that it is important to clarify the maximum strength of the quadrupoles QT13L5.B1 and QT13R1.B1.

Verena Kain presented the plans for the upcoming dry runs of week 22, 23, and 26. The overall planning up to September 2009 was shown ([slides](#)).

Eugenia Hatziangeli said that all the 2008 data will be retrieved and stored in the additional memory space recently bought and now available.

Jörg Wenninger said that during the powering tests of TI 8, few main convertors regularly tripped and the cause was traced back to the warm magnet interlock system. A bad card was diagnosed, a crate replaced and finally a long powering run was done without any problems. TI 8 BI equipments are all tested and ready. A final dry run will be done 3 days before the beam tests. [Beam test programme](#).

Brennan Goddard had asked if there were any other needs for additional tests during the TI commissioning. So far only a request from the collimator team has been received. Should there be any other needs, please contact Malika Meddahi.

4. New MADX release, BV flag and polarity flag - F. Schmidt and M. Giovannozzi

F. Schmidt said that the latest MAD-X version has been released ([slides](#)). To note: the official production version is called Madx, the old production version -with individual BV flag- Madx_old and the development version Madx_dev.

The main feature of the new production version is to eliminate individual BV flag and related bugs. Thys Risselada created the official new LHC sequence files without individual BV flag while keeping the old ones in the "obsolete" folder.

Comments:

- The use of the individual BV flag stops the execution of the new MAD-X production version to avoid any confusion between the code and the LHC sequence versions;
- The main use of the BEAM BV Flag is for the LHC two-in-one;

- For actual studies a FORWARD version of BEAM2 was created -called BEAM4;
- The use of the BEAM BV Flag for other machines is okay but be aware that this may not be what you want, e.g. focusing quadrupoles become de-focusing quadrupoles so a Twiss output will be completely different for BV=+-1;
- The recommendation for an inversion of a line is to REFLECT the sequence and control signs of dipoles and quadrupoles manually.

It was clarified that the optics were previously logged in CVS, but as CVS is now stopped, SVN will have to be used.

Massimo Giovannozzi continued the presentation addressing the LHC MAD-X polarity flag ([slides](#)). He reminded that some years ago Stephane Fartoukh had proposed to define a property of the magnets in the LHC MAD-X sequence to allow translating MAD-X polarity conventions into LHC machine polarity conventions and vice versa.

A first implementation was prepared by Thys Risselada (using V6.501 sequence) and included in the layout database. It was a key ingredient for the cross-check and debugging of the machine settings during 2008 beam tests. A detailed cross-check of other magnet classes was launched by end of 2008 (including a revised specification) in preparation to 2009 beam activities. Massimo remarked that there are still some unclear cases of the circuit polarities, like skew quadrupoles and skew sextupoles, where a wrong polarity flag might explain the beam-based measurement results.

The proposal for the specification of the polarity flag was given as

$\text{Sign}[K_{\text{twiss}} * bv * \text{polarity_flag}] = \text{Sign}[\text{current in LHC}]$, where K_{twiss} stands for the element strength as reported in a Twiss output. It can be computed taking into account the informations which are available in the layout database.

For a normal element: $\text{polarity_flag} = \text{Sign}[I * dn B_y/d x_n]$

and the opposite should be taken for elements represented as H-kickers in the MAD-X sequence

For skew element: $\text{polarity_flag} = \text{Sign}[I * dn B_x/d x_n]$

Outlook:

- Last discussion to clarify the specification was made last week with the data base colleagues.
- First draft implementation of the polarity flag is expected in about 10 days.
- Then, cross-check of new implementation, as well as comparison with the old one should be performed.
- In a month aim at having a fully debugged polarity flag implemented in the LHC sequence.

Mike Lamont clarified that there is a calibration sign in LSA and Stephane Fartoukh proposed that the signs are checked w.r.t. the ones in the data base.

5. RF through sequences - Andy Butterworth

Andy Butterworth presented the status of the RF through the sequences ([slides](#)).

A list of the functions provided by FGCs was shown and examples given for the cavity controllers and the beam control (per beam and common for the two beams).

It was recommended, in order to change the delta p, to change the RF frequency (frequency program beam1-2 (offset from 400 MHz))

The detailed list of RF actions during LHC cycle for the injection, ramp, preparation for physics and physics processes was given (details in Andy's talk).

Concluding remarks on the actions required from sequencer:

- Initial switch on of RF power & Low Level
- Setup of synchro and beam control loops before injection
- Injection requests giving next injected ring/bucket
- Bunch intensity via timing?
- Bunch pattern via FESA
- Rephasing before physics
- Frequency trims during physics?
- Function management cf. power converters

Andy added that a standby mode of the RF is foreseen to save energy (after a beam dump for example).

Stephane Fartoukh pointed out that the momentum compaction will not be the same for the various optics, and if it is used by RF it is worth clarifying that a maximum difference of 2-3% is to be expected.

Andy said that RF tests in Point 4 will be performed next week. Other tests still need to be scheduled.

6. A.O.B

LHCb requested for additional beam onto TI 8 TED on 11/12 July during TI 2 tests.

It was decided that

- **The final request will be re-discussed after the TI 8 tests of 6 - 7 June.**
- **A more favorable date would be during the reserved dates of 22 / 23 August.**

Next meeting

Tuesday 26 May 2009, **15:30**, 874-1-011. Agenda will be sent in due time.

Malika Meddahi