

94th Meeting of the LHC Collimation Working Group, February 18th, 2008

Present: Ralph Assmann (chairman), Giulia Bellodi, Dariusz Bocian, Till Tobias Bohlen, Chiara Bracco, Markus Brugger, Bernd Dehning, Barbara Eva Holzer, Daniel Kramer, Michel Jonker, Aurelien Marsili, Laurette Ponce, Agnieszka Priebe, Stefano Redaelli (scientific secretary), Mariusz Sapinski, Lucia Sarchiapone, Thomas Weiler, Christos Zamantzas.

Comments to the minutes and follow-up of actions

Mario Deile commented by email that the request of the collimation working group to set-up the TOTEM Roman pots other machine modes in addition to the "ADJUST BEAMS" mode should be accepted by the Machine Protection working group. R. Assmann will ask R. Schmidt to follow this up.

Markus Brugger asked to add to the action list of the last minutes the request to AT-VAC to provide estimates of the vacuum pressure and molecule distribution in the collimator region. The [open action web page](#) has been updated.

As a **follow-up of the open actions from last meeting**, the **third collimator prototype** requested for impedance measurements was procured. However, it will first be used for a hardware endurance test requested by the CPS meeting (see minutes of [Feb. 19th, 2008](#)). The impedance measurements hence are delayed by a few weeks. The meeting between FLUKA and ABP teams to define the **energy deposition studies** for Phase I could not take place due to the absence of various key people last week. It will take place as soon as possible and will also determine a proposal list of locations of the additional **temperature sensors** to be installed by AT-VAC.

Agenda of this meeting

- Results of the 2007 BLM hardware tests in LSS5 (D. Kramer)
- Beam Loss Calibration Studies at the LHC Collimator in LSS5 (T. Bohlen)
- A.O.B.: Proposal for collimator MD's at the SPS.

List of actions from this meeting

| Action | People | Deadline |
|---|------------|------------|
| Submit a request for collimator MD's at the SPS | R. Assmann | Done |
| Determine case studies for fast BLM data transmission to be tested in the 2008 SPS MD's | M. Jonker | End March |
| Update of old CSS collimator FESA class to Linux platform | M. Jonker | End Feb. |
| Provide to the BLM team the damage limits (proton losses per second) for the various collimator types | R. Assmann | Mid-March. |

(Complete list at <http://lhc-collimation.web.cern.ch/lhc-collimation/action.htm>)

The next meeting will be announced.

Provisional agenda: <http://lhc-collimation.web.cern.ch/lhc-collimation/>

Minutes of the meeting

1 Results of the 2007 BLM hardware tests in LSS5 (D. Kramer)

D. Kramer presented the BLM measurements that were performed during several SPS MD's in 2007 and discussed further MD requests for 2008. Daniel reviewed the various BLM installations in LSS5 and the corresponding electronics configurations.

Losses of about 10^{13} p at 26 GeV were induced on the collimator jaw in order to check the **BLM dynamic range**. As expected, the ionization chambers were saturated by far whereas the SEM chambers provided a correct signal. Simulations of signal response for the two chamber types show a good agreement between estimated and measured responses.

D. Kramer also showed results of measurement of **cross-talk** between signals from different monitors that share the same acquisitions card and/or the transmission cable (8 monitors use one NG18 cable). Depending on the case, cross-talks ranging from a few permille to **several percents** were measured. R. Assmann pointed out that this seems to much for the LHC: in IR7 the large losses at the TCP's of one beam could hide the losses of the other beam, which are several order of magnitude smaller at the location of the TCP's of the first beam. Daniel replied that, based on the observations, the layout of cables and electronics cards was optimized as much as possible (see page 13 of his transparencies). Bernd Dehning agreed but also commented that this effect depends on the derivative of the signal and it is expected to be negligible for integration times of about 1 s and larger.

D. Kramer presented also the Fourier analysis of fast BLM signals. As it was already seen in the MD's of 2006, the spectrum of these signals shows the beam jitters at various frequencies, in particular at the betatron tune and at the multiples of 150 Hz, due to the three-phase converters of the SPS magnets. The BLM team requested **additional MD time at the SPS** in order to verify halo oscillations and correlate them with fast BPM measurements. Additionally, combined studies with the SPS scraper team will also be performed to investigate the halo re-population.

2 Beam Loss Calibration Studies at the LHC Collimator in LSS5 (T. Bohlen)

Till Bohlen is a student who works in the BLM team on the prediction of the BLM thresholds at the LHC. SPS results are used to benchmark the simulations tools and for this purpose a FLUKA model of the SPS collimator prototype and of its associated BLM's was setup. Till presented the preliminary results of the comparison between simulations and measurements in various conditions. The results are in fairly good agreement however the accuracy is limited by the uncertainty on the experimental conditions (total intensity lost in the collimator jaws, impact parameters). Therefore, T. Bohlen requested **additional MD time** for 2008. He estimates that two MD's of 2 to 4 hours (possibly performed parasitically with the SFTPRO beams) would be sufficient.

In addition, T. Bohlen brought up the request from the BLM team to provide the **damage limits for the various collimator types** in order to define as soon as possible the operational threshold levels. R. Assmann will provide a table of the known damage level for the various collimator types. Limits for the TCT's are not yet available but they are being investigated. Responding to a question by R. Assmann, G. Bellodi replied that the damage levels for ions beam are not yet clarified.

Commenting on the problem of **missing/delayed BLM data** during the MD, S. Redaelli asked if the problem is solved. C. Zamantzas replied that this was induced by overload of the CPU's that control the acquisition chain. Large amount of data were requested continuously by (1) the *post-mortem* system (the test of which was the main motivation for the MD)

as well as from (2) the collimator system (jaw movements triggered the transmission of collimator transient BLM data and also of the *post-mortem* buffer) and from (3) the SPS timing (injection events were used to trigger acquisition of the data presented in the next section). This is not a standard mode of operation that is not foreseen for the LHC (at most one acquisition at a time should be requested). In any case, an improvement of large data flows has been promised for the new version of FESA. R. Assmann commented that we should test the final implementation during beam tests this year. S. Redaelli also reminded that last year we tested the first version of the **LHC data concentrator**, which should also be assessed in its final configuration.

3 A.O.B.: SPS MD requests for 2008

It was decided to request **three 8-hour MD's** at the SPS for collimator studies with **coasting beams** in order to (1) investigate the time structure of beam loss measurement; (2) study the absolute beam loss signals; (3) study the beam-based collimator calibration and (4) to test fast BLM acquisition during collimator movements. R. Assmann will submit the MD request as soon as possible. These collimator MD's will be requested independently of the requests from the BLM and SPS scraper teams however they can be combined in order to optimize the setup time for coasting beams. Detailed MD planning will be worked out by the teams involved. In addition, the collimator team will also provide support for the parasitic MD's proposed by T. Bohlen.

C. Zamantzas asked which BLM data are requested by the collimation team with highest priority. S. Redaelli responded that our highest priority is to reliability get the **integrated beam losses at 1 Hz**, which are essential for the collimator setup and were not performing as expected this year (for CPU overload issues discussed above). The final configuration of the BLM data concentrator, which will provide these data, should be used and tested thoroughly. In addition, we need the **transient buffer for the fast, automatic alignment**. Additional requests of faster data acquisitions (e.g. what has been shown by D. Kramer) can be available but we should make sure that they do not compromise the core requirements. M. Jonker will provide a **detailed list of case studies** for transient BLM acquisition parameters to be tested in view of the automatic collimator alignment procedures, in particular C. Zamantzas asked to specify typical values for the frequency of requests of data requests.

S. Redaelli pointed out that the FESA gateways have recently changed OP system and the old CSS class for the SPS prototype control does not work anymore. M. Jonker will look into that and report back as soon as possible.

The next meeting will be announced.