110th Meeting of the LHC Collimation Study Group

February 1st, 2010

Present: Ralph Assmann (chairman), Giulia Bellodi, Alessandro Dallocchio, Chiara Bracco, Adriana Rossi (scientific secretary), Lewis Keller (SLAC), John Jowett, Luisella Lari, Francesco Cerutti, Steve Lundgren (SLAC), Nicolas Mounet, Jeffrey C. Smith (SLAC), Jorg Wenninger, Roderick Bruce, Jean-Philippe Tock, Giuseppe Bregliozzi, Fritz Caspers, Gonzalo Arnau Izquierdo, Yngve Levinsen.
Excused: E. Metral, A. Bertarelli.

1 Comments to the minutes

No comments to the previous minutes.

2 Agenda of this meeting

1. Regular collimation status reports:
    a) Hardware and tunnel activities, if any
    b) Remote and beam commissioning
    c) Phase II activities at CERN
    d) Phase II activities at SLAC
    e) Cryo-collimators
    f) FLUKA work

2. Special reports :
    a) Modification of SC dispersion suppressors to accommodate additional collimators – J-P. Tock, TE/MSC
    b) Collimators and beam cleaning: first results and future plans – C. Bracco, TE/ABT
    c) Summary of the collimation upgrade plans – R. Assmann, BE/ABP

3 List of actions from this meeting

Action	People	Deadline
Fit acceptance tests into schedule, before delivery to CERN	SLAC	
Dedicated simulations of scenarios run in 2009 to compare with measurements	FLUKA team	
Calculate radial movement for alternative DSR solution and check interferences with transport zone.	J. Jowett J-Ph. Tock	

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

The next meeting will be on February 15th .

Minutes of the meeting

R. Assmann announced that S. Redaelli becomes deputy chairman of the Collimation Study Group Meeting, and A. Rossi the new scientific secretary.
He also introduced R. Bruce, new fellow in the Collimation team.

The approval of Phase II collimation is on the way. We now need to provide a detailed planning and cross-check our predictions against reality.

1 Regular collimation status reports

1.1 Hardware and tunnel activities (R. Assmann on behalf of O. Aberle EN/STI)

- The microphones to register the noise from shockwaves on collimators have been installed, and cabled up to the racks.
- The injection TI2 collimator TCDIH20607 (which had the wrong orientation) has been replaced with the TCDIV20607.
- RBAC has been checked and deployed in the tunnel. An 'offline' mode has been added to be able to intervene on single collimators (for example a piquet intervention) without changing all thresholds.
- One collimator prototype for Phase II (with integrated BPMs) has been installed in the SPS.

1.2 FLUKA (F. Cerutti EN/STI)

- Collimator activation studies have been completed by L. Lari.
- They are actively working on the 3.5TeV scenario to evaluate consequences of losses on warm magnets
- R. Assmann asked for dedicated simulations of scenarios run in 2009 to compare with measurements.

1.3 Phase II activities at SLAC (J.C. Smith) – see slides

- The production is proceeding as expected.
- Delivery schedule …
- R. Assmann asked that acceptance tests before delivery to CERN should be included in the schedule, commenting that CERN measurements should be only to cross-check quality, not to find surprises.

2 Special topics

2.1 Modification of SC dispersion suppressors to accommodate additional collimators (J-Ph. Tock, TE/MSC) – see slides

J-Ph. Tock showed the "Baseline" proposal for IR3 and IR7:

- Leave Q8, Q9, Q10 and Q11 in place.
- Displace Q7, the DFBA and 2 dipoles by 3m to leave room to a collimator next to Q8
- Move 2 dipoles and replace the Connecting Cryostat (CC) with a shorter one to place a collimator next to Q10.
- There will also be a radial movement of 7 elements 30 mm inwards (in the transport zone).

The big disadvantage of this solution is the complications of moving the DFBA and the very restricted room available for the cryo-line connections.

He then presented an alternative solution leaving Q7 and the DFBA in place:

- Displace Q8, Q9 and Q10 and 6 dipoles towards Q11.
- Replace the Connecting Cryostat (CC) with a shorter one.
- Move the whole region radially, but displacement to be evaluated.

The main advantage of this solution is that the DFBA will not be moved (3m displacement is not possible at all locations).

R. Assmann, J. Jowett and J. Wenninger all objected that this alternative solution would cause a change in optics (to be checked), moving IPs, geometry changes, and does not look possible. Studies will nevertheless be performed to check its feasibility.
J. Jowett will start by calculating the radial movement and see if this interferes with the transport zone.
R. Assmann asked if, with the baseline solution, the corrector magnets are sufficiently powerful to correct orbit. J. Wenninger replied that this may be possible for small angles (5 mrad), but should be looked at.
A. Rossi asked what would be the cryo-collimators temperature. J-Ph. Tock replied the allocated 3 meters are compatible with the 2 solutions presently under study by MME; namely, either warm collimators with one CWT on each side, or collimators working at cryogenic temperature.
F. Caspers pointed out that if the collimator should work at low temperature, one should see how material properties change, and in particular impedance.
G. Bregliozzi asked to have mounted inside the cryo-collimators some kind of beam screen, to limit gas condensation on beam facing surfaces. R. Assmann said that in GSI they have already employed something similar.
J-Ph. Tock asked and had confirmed the possibility of staging the installations, in particular delaying IR2, where there are different constraints, the need of only one collimator and a sequence has yet to be worked out. He also asked if it is possible to do one side at a time, and R. Assmann replied that this is possible because ~100μrad are easy to compensate for.

2.2 Collimators and Beam Cleaning: First Results and Future Plans (C. Bracco TE/ABT) – see slides

C. Bracco presented a summary of hardware commissioning, set up (beam base alignment and thresholds) and operation (loss studies) with collimators Phase I, carried out in 2009 by the Collimation team, previously shown in EVIAN '09.
R. Assmann commented that while the collimators guarantee some protection in the horizontal plane, this is not the case in the vertical plane.
J. Wenninger asked if the collimator settings are stored in LSA in mm or in sigmas. R. Assmann replied that at the moment it is only in mm,

2.3 Summary of the Collimation Upgrade Plans (R. Assmann BE/ABP) – see slides

R. Assmann presented the talk he showed in Chamonix '10.

- He explained that during Phase II, TCSG collimators will still be used at injection and ramping, up to stable beam operations, while TCSM's can be inserted in the beam only when the beam is stable (high losses directly on the collimators would damage them). The TCSG will then be retracted if possible – depending on needs and the acquired beam experience – to reduce impedance.
- Vertical losses are not affected by off-momentum particles, and this reflects in a better cleaning efficiency, as it was measured in 2009.
- Beam losses are > 1‰, so as we can increase beam intensity Phase II collimators will become urgent.
- Cryo-collimator could be single sided, but a 2 jaws collimator is easier to centre around the beam.
- SLAC have to produce 2 prototypes, one to be installed in the SPS and one in the HIRADMAT facility.
- He presented a plan where the modification of the dispersion suppressor regions will be done in 2012 (or later depending on LHC planning) and Phase II collimation will be completed by 2014/2015.