

## 109<sup>th</sup> Meeting of the LHC Collimation Study Group, December 7<sup>th</sup>, 2009

*Present:* Ralph Assmann (chairman), Giulia Bellodi, Alessandro Bertarelli, Chiara Bracco (scientific secretary), Markus Brugger, Barbara Eva Holzer, Lewis Keller (SLAC), John Jowett, Luisella Lari, Steve Lundgren (SLAC), Thomas Markievicz (SLAC), Nicolas Mounet, Roberto Losito, Stefan Roesler, Jeffrey C. Smith (SLAC), Daniel Wollmann.

### Comments to the minutes

No comments to the previous minutes.

### Agenda of this meeting

- Regular collimation status reports:
  - a) Hardware and tunnel activities (R. Losito, EN/STI team)
  - b) Remote and beam commissioning (R. Assmann, BE/ABP)
  - c) Phase 2 at CERN (A.Bertarelli, EN/MME team)
  - d) Phase 2 at SLAC (T. Markievicz, SLAC team)
  - e) FLUKA work (M.Brugger, FLUKA team)
  
- Discussion of beam tests with LHC collimators (round table)
- Studies on collimation with hollow electron beams at Fermilab (G. Stancari)
- Energy deposition studies for phase II collimators (L.Lari)

### List of actions from this meeting

Action	People	Deadline
Define acceptance criteria for SLAC phase II prototype installation in the SPS	SLAC team	
List of collimators to be used for radiation on electronics studies	FLUKA team	

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

The next meeting will be To be defined.

# Minutes of the meeting

## 1 Regular status reports

### 1.1 Activity in the tunnel (R. Losito)

No news from the tunnel. R. Assmann just reminded that 4 microphones have been installed in the cleaning insertions and that they could be used starting from January 2010. The acquisition system is still missing and this does not allow to use them before the Christmas break.

### 1.2 Remote and beam commissioning (R. Assmann)

R. Assmann reported about latest news from the control room. He underlined that, up to now, collimation is a success. A first collimator alignment to nominal injection settings has been performed (November the 29<sup>th</sup>) and a local cleaning efficiency better than 99.9% has been achieved. First loss maps, showing that particles are mainly lost in the collimation insertions, have been presented at the lmc meeting (see slides). R. Assmann commented that unexpected losses are observed at the MQ11 downstream of the momentum cleaning insertion, where the dispersion is maximum. These losses could be induced by particles experiencing single diffractive scattering at the primary collimators in IR7 and reaching IR3. A much lower rate of such events was foreseen at injection energy and further investigations, also at higher intensity, are needed.

R. Assmann affirmed that a big amount of data is already available and first FLUKA studies could be performed to check if the energy deposition decay, from the beginning to the end of the cleaning insertions, is in agreement with the predictions. M. Brugger commented that, in order to make this check, one should know the integrated number of protons. R. Assmann replied that it would be enough to look at the ratio of losses at the different locations and that data of beam intensity vs time are available. B. Holzer suggested to look also at the BLM data corresponding to signals with an integration time longer than one second.

She added that BLM are working fine and thresholds at the tungsten collimators have been relaxed as an outcome of some tests performed by scraping the pilot beam with the TCLA. Instead, some problems still persist for the injection protection collimator TDI. R. Assmann underlined that the impact of jaw angle on BLM readings has also been tested and no significative change has been found.

L. Keller asked if background data are already available. R. Assmann replied that no squeeze has been performed yet and that the triplets are shadowed by the arc. The only source of background was induced by residual gas.

R. Assmann explained that, after recovering the golden reference orbit used for the first setup, all the collimators were set back to the nominal settings (December the 5<sup>th</sup>) showing a very nice reproducibility. Active thresholds of  $\pm 0.5$  mm were then set around the actual position and, up to now, no interlock have been driven by collimation. It was also proven that collimators did not reduce the beam lifetime, as initially suspected, but that this was instead influenced by the transverse damper.

### 1.3 Phase II activities at CERN (A. Bertarelli)

A. Bertarelli invited people to attend the phase II design meeting on December the 8<sup>th</sup>, 2009 at 14:00 in room 376-1-016. He added that first results on energy deposition studies for the final design will be presented and that they look very promising.

## 1.4 Phase II activities at SLAC (J. Smith, T. Markiewicz)

The design of SLAC phase II collimators with 60 cm aperture and BPM has been finalized. J. Smith and T. Markiewicz presented some pictures showing several phases of the jaw brazing procedure (see slides). Vacuum chamber has also been shown, seal checks have still to be performed. R. Assmann pointed out that acceptance criteria have to be defined as soon as possible. O. Aberle was in contact with people from installation and it looks like it is possible to keep the CERN prototype and install the SLAC prototype in a different location in the SPS.

## 1.5 FLUKA Work (M. Brugger)

Data of losses on warm magnets and with flag for single diffractive scattering events at 3.5 TeV have been received. Calculations for energy deposition are on going.

## 2 Discussion of beam tests with LHC collimators (round table)

R. Assmann pointed out that the main aim of this meeting was to define a list of measurements that should be inserted in the commissioning plan for the next 2 weeks. He added that betatron and momentum loss studies will continue for every step in beam energy and intensity both from the cleaning efficiency and machine protection point of view. Parasitic studies of energy deposition on electronics could be performed already with the pilot beam since this low intensity allows to scrape the full beam with the collimators. FLUKA team should provide a list of candidate collimators to be used for dumping the beam.

N. Mounet said that intensity is too low to be able to see any effect of collimation induced impedance. According to simulations, he believes that a minimum intensity of  $6 \times 10^{10}$  protons per bunch is needed to see a tune shift of  $2-3 \times 10^{-4}$  when closing all IR7 collimators to  $3\sigma$ . R. Assmann replied that a higher intensity is required also for loss studies, in particular:

- $10^{11}$  protons per bunch: single bunch cleaning efficiency
- $10^{12}$  protons total intensity: first effects of high intensity.

No special requests came from the BLM and ion teams.

## 3 Studies on collimation with hollow electron beams at Fermilab (G. Stancari)

Postponed to next meeting

## 4 Energy deposition studies for phase II collimators (L.Lari)

This talk will be presented at the phase II design meeting on December the 8<sup>th</sup>, 2009 at 14:00 in room 376-1-016.

## 5 A.O.B

CWG meetings will restart after the Christmas holidays

**The next meeting will be To be defined.**

uncomment