

## Minutes of 1<sup>st</sup> Collimation Upgrade Specification Meeting

**Participants:** R.W. Assmann (RA), A. Bertarelli (AB), C. Bracco (CB), R. Bruce (RB), F. Cerutti (FC), B. Dehning (BD), L. Lari (LL), A. Marsili (AM), E. Métral (EM), S. Redaelli (SR) (Chairman), S. Roesler (SRo), D. Wollmann (DW).

**Excused:** J. Jowett, V. Parma, A. Rossi, L. Rossi, M. Schaumann, J.-P. Tock.

# 1 Study of IR collimation in the DS – kick-off meeting (S.Redaeli)

Slides available at this link.

## 1.1 Summary of the presentation

SR presented some first views about the studies required for a new collimation in the dispersion suppressors (DSs) of the interaction regions (IRs). SR started with a brief outlook of LHC collimation in 2011 at 3.5 TeV. The collimation performance is very good with total stored beam energies well above 100 MJ and indeed the present extrapolation to higher energies indicate that the cleaning of the present system could be compatible with the ultimate LHC intensity. This topics will be addressed in detail at the Chamonix meeting.

Therefore, the priority of finalizing the design of a cold collimation in the DSs of the betatron (IR7) and momentum (IR3) cleaning insertions has become less urgent. Indeed, as a follow-up of the 2011 collimation external [review](#), the work on the DSs of the cleaning insertions was postponed until after LS1.

On the other hand, the operational experience in 2011 showed that the losses in the experimental regions from luminosity debris can be an issue, both for proton and for ion beams. Losses in the dispersion suppressors of IR1, IR2 and IR5 have already affected the LHC operational efficiency (effects of radiation to electronics, delayed access in the machine during beam operation due to radiation constraints, potential issues of magnet lifetime, ...). These losses in the IRs can be cured by a local collimation in the DS regions and it is now urgent to finalize a new collimation layouts for a **possible upgrade in LS2**, in combination with 11 T dipoles in the DSs. Note that this is before Hi-Lumi LHC and therefore the proposed solutions must be compatible with the present optics as well as with the future upgrade layouts. New layouts for collimation in the DS must be taken as inputs for the Hi-Lumi optics studies.

This motivates the need for this new series of Collimation Upgrade Specification meetings. The **mandate** of this working group is:

*Study beam dynamics and operational aspects of new collimation schemes in the dispersion suppressors of the insertion regions of the LHC and upgrade scenarios beyond LS1. Identify open issues and assign priorities to the work required and provide the necessary inputs to the team involved, including external collaborators.*

The list of goals for the immediate and mid-term future are outlined in SR's slides.

SR also presented a preliminary list of people for **invitation list**. All the teams related to collimator aspects are represented, even if not everybody needs to participate to all meetings. In particular, the first meetings will be focused on the setup of simulations. Only later on,

when we will be ready for a full technical evaluation, the full expertise will be required. The supporting teams from EN and TE are requested to report to this meeting.

**Action: SR invited all the people in the list to provide feedback about the invitation list.** The present list is attached to the minutes, with the additional people that are added to the minute distribution list.

## 1.2 Discussion

AB asked with is the performance reach in terms of IR7 cleaning with the present system. RA replied that his estimates indicates a factor 4 above the nominal intensity at 7 TeV. SR commented that there is a caveat on these figures is the scaling of parameters like beam lifetime and quench limits at higher energies. RA replied that we expect no big surprises there because we are well above ultimate intensity, with some factors. FC commented that FLUKA results confirm these figures within factors 2–3. In response to the comment by SR about the quench limit, BD stated that we do have results of quench tests. SR replied that tests performed so far with the real distributions from IR7 cleaning for protons and ions failed so far to quench magnets even if the design loss rates were achieved. Dedicated quench tests with local bumps are not necessarily representative of the limitations from collimation losses.

AB asked if the study of “**Phase II**” **materials** for the upgrade of the secondary collimators in IR7 and IR3 will be addresses in this meeting. RA states that these aspects should indeed be discussed as this meeting (the mandate has been updated accordingly). No decision can be made before the execution of the HiRadMat material tests scheduled for this year. At the end of the year we will be in a position to concluded about new TCSM material and we will have to decide if any change should take place already in LS2. RA also reminded that the collimators might just have to be changed because of aging, even if cleaning and impedance of the present system will be appropriate. This would be an opportunity to improve design and materials.

Triggered by questions about collimator materials, EM commented about the machine impedance. Present simulations indicate that there should be no problems at 7 TeV provided that the collimators are not operated at gaps smaller than the tight settings proposed for 2011. Clearly the evolution of the impedance models if a primary input for the material choice and the operational experience in 2012 with tight settings will be taken into account.

## 2 Next meeting

The next meeting will be held on

**February 3<sup>rd</sup>, 2012, 16:00–17:30.**

**Room: 874-1-011 (CCC).**

### **Tentative agenda:**

V. Parma Report from CCFS meeting

S.Redaeli Discussion on Chamonix presentation on collimation upgrade

## **3 Attachment: invitation and minute distribution lists**

Note that the participation to the meeting is open and people interested can be added to the invitation list.

### **3.1 Members of the invitation list**

#### **3.1.1 CERN members**

Adriana Rossi, Alessandro Bertarelli, Alessandro Dallocchio, Alessandro Masi, Bernd Dehning, Bernhard Holzer, Brennan Goddard, Chiara Bracco, Christian Boccard, Daniel Wollmann, Elias Métral, Erk Jensen, Ezio Todesco, Francesco Bertinelli, Francesco Cerutti, Fritz Caspers, Giulia Bellodi, Giuseppe Bregliozzi, Jean-Philippe Tock, John Jowett, Jorg Wenninger, Lucio Rossi, Luisella Lari, Marco Garlasche, Massimo Giovannozzi, Michaela Schumann, Mike Lamont, Mikko Karpinnen, Nicola Mariani, Oliver Aberle, Oliver Bruning, Ralph Wolfgang Assmann, Rhodri Jones, Roberto Losito, Roderik Bruce, Rudiger Schmidt, Stefan Roesler, Stefano Redaelli, Stephane Fartoukh, Vincent Baglin, Vittorio Parma.

#### **3.1.2 Members from other institutes**

Grahame Blair (Royal Holloway), James Molson (Manchester), Hywel Owen (Manchester), Javier Resta (Valencia), Adina Toader (Manchester), Lewis Keller (SLAC), Maurizio Serluca (Manchester), Robert Appleby (Manchester), Tom Markiewicz (SLAC), Angeles Faus-Golfe (Valencia), Nikolai Mokhov (FNAL).

### **3.2 Additional members for the minute distribution list (TBD)**

Freddy Bordry, Paul Collier, Steve Myers, Roberto Saban, Ronny Billen, Eugenia Hatziangeli.