

## 73<sup>rd</sup> Meeting of the LHC Collimation Working Group, July 7, 2006

*Present:* Alessandro Bertarelli, Giulia Bellodi, Chiara Bracco, Hans Braun, Roedrick Bruce, Markus Brugger, Francesco Cerutti, Alfredo Ferrari, Simone Gilardoni, Andres Gomez Alonso, Matteo Magistris, John Jowett, Suitbert Ramberger, Stefano Redaelli (scientific secretary, chairman), Guillaume Robert-Demolaize, Stefen Roesler, Lucia Sarchiapone, George Smirnov, Thomas Weiler, Vasilis Vlachoudis.

### 1 A.O.B.

R. Assmann could not attend this meeting because he was involved in a meeting with the collimator manufacturer. He excused himself. S. Redaelli chaired the meeting.

### 2 Plans for future FLUKA studies (A. Ferrari)

Alfredo Ferrari discussed the plans for the FLUKA collimation studies of 2006 and 2007. This follows up what was discussed at the 67th meeting of the collimation working group, held on March 20th, 2006, when a preliminary list of pending items was outlined. A. Ferrari stated that additional iterations will certainly be required among the involved teams to agree on a coherent work plan.

At first, A. Ferrari presented the available man power of the FLUKA team for LHC collimation studies (to which Alfredo included the energy deposition studies at IP6). M. Magistris has left the team to join as a staff member the SC-RP group. M. Santana-Leitner is at the end of his fellowship and will start a new job at SLAC in September 2006. Alfredo acknowledged Matteo and Mario for the excellent work of the last years. Two new staff members (Markus Brugger and Francesco Cerutti) and a fellow (Lucia Sarchiapone) have joined the team. Another fellow will start on December 1st, 2006. Detailed estimates of the available manpower until the end of 2007 are given in A. Ferrari's slides, page 5.

S. Redaelli asked if at SLAC Mario will work on collimation Phase II. Alfredo replied that this is not his understanding. He thinks that Mario will work on ILC topics.

A. Ferrari then discussed the various pending issues that have been discussed in the recent meetings. We list below the various items that were discussed. We also note that at the next meeting of July 17th Mario Santana-Leitner will report on the latest IR7 studies. This will close some of the pending actions but could also give rise to additional items for future studies (e.g., cooling of the passive absorbers). The list of accomplished items is not discussed in detail here.

▷ Passive absorbers of IR7

These studies are basically concluded. The work carried out for different configurations and materials have been documented in a note under preparation and will be reported by Mario at the next meeting. **Missing** are the studies of **cooling**, which will require 2 to 3 weeks of work.

▷ BLM studies

The work required from the BLM team has been completed. A **new request** has recently come up: the BLM team asked to have the **position/direction/energy/type of each particle entering the BLM's**, in addition to the values of deposited energy provided so far. A. Ferrari stated that further discussions are necessary before deciding to start work in this direction (estimated time is up to 2 weeks). He does not clearly see the advantage of providing these inputs. No BLM team representative was at the meeting. Further off-line discussions will take place.

▷ Failure scenario at 7 TeV

A. Ferrari stated that according to his understanding these studies were **concluded** with the work of Andy Presland, as reported at the collimation working group meeting. The result was that the collimator heating was very low and it was concluded that it was not worth repeating the thermo-mechanical analysis (A. Bertarelli). S. Redaelli reminded that the next step to A. Presland studies would be to check another failure scenario on the 1 m long TCSG (first studies were only done for the 60 cm long TCP), which could not be accomplished because A. Presland left.

▷ Additional failure scenarios / commissioning scenarios

A. Ferrari asked that the ABP team should come up with a **detailed list of interesting failure and commissioning scenarios** to be considered. This is the pre-requisite for estimating in detail the required manpower.

▷ Energy deposition studies at injection energy

Simulations have been run and results will be discussed by Mario. However, A. Ferrari stressed that these studies were done for the first time and hence **thorough checks are needed**, which could require 2 to 3 additional weeks.

▷ Beam 2 studies

This topic will require a significant amount of work. Setting-up, running, analysing and debugging might easily require up to **4 months** (at least 2 months will be required to get the geometry ready). A. Ferrari thinks that we must do these studies. However, we should decide when we can invest such amount of time.

▷ TCDQ halo loads

The work has started as a collaboration between the collimation team and the dump team. A. Ferrari has got from B. Goddard a recent “wish list” of the desired studies to carry out (see page 10 of his slides). The list seems fairly ambitious and is certainly enough to occupy L. Sarchiapone for the rest of 2006 and part of 2007. A. Ferrari suggest another discussion between R. Assmann and B. Goddard to make sure that they agree on the proposed list and on the priorities.

S. Redaelli commented that it was also agreed to investigate TCDQ halo loads with reduced collimation systems at commissioning, which does not appear explicitly in Brennan’s list but has probably to be pursued with high priority.

▷ Loads on the injection protection devices

These studies are potentially time consuming because the models of IR2 and 8 does not exist and should be made from scratch. If a detailed model of part of IR2 and IR8 is required, several months of work will be needed.

▷ Simulation benchmarking with IR3 simulations

A. Ferrari stated that setting up the FLUKA model for IR3 is represents a significant effort. He believes that this is not worth just for a code benchmarking. However, if the IR3 model has to be build anyway for other studies (e.g., phase II collimation - see below), then the comparison can be carried out.

S. Redaelli reminded that the discussion on code benchmarking came up because the differences for the passive absorber requirements in the two IR’s were not fully understood. It is worth investigating the differences even without building the full IR3 model in FLUKA.

V. Vlachoudis requested that, if the IR3 model has to be built, that should be decided fairly soon in order to set up the required working team. **Mid September** seems a reasonable **deadline**.

▷ Phase II collimation studies

This is a major issue that has to be tackled with high priority. It will be very hard to make estimates of the required manpower until a more detailed plan for these studies will be agreed among ABP, ATB and TS. An initial set of assumptions should be agreed on soon. We should also decide when the FLUKA studies for the Phase II collimation should start: after Summer or in 2007? Starting this year will slow down other studies but starting much later could be too late.

S. Redaelli commented that R. Assmann intends to start soon the organization of the Phase II studies at CERN and that he will coordinate these studies.

A. Bertarelli said that he plans to start mechanical engineering studies from September. He wants to start investigating different options for the jaw materials and to study new geometries soon after. He agrees that we must start as soon as possible discussions among the teams involved.

▷ Skew halo studies

A. Ferrari wondered whether the statement that skew halo should be less critical is still valid. If this is the case, he would put these studies to **lower priority**.

S. Redaelli said that it would certainly be interesting to carry out these studies and asked whether the runs would cost only CPU time. Alfredo replies that in principle this should be the case but experience teaches that every time one changes the inputs, it always takes longer than expected to get the simulations fully working. He would estimate a 2-3 weeks for these studies to be carried out.

▷ Component heating in case of failure scenario

Is this still needed? The studies of A. Presland suggested that there should be nothing to worry about. However, we should still understand where the energy escaping the collimators goes. Mario will discuss the energy balance for the nominal cleaning case but similar studies for the failure cases have not been done.

In addition, the following topics have come up:

▷ Heating of the warm quadrupole supports

Several weeks ago S. Redaelli asked to M. Santana-Leitner if he could provide estimates of the quadrupole support heating due to hadronic showers. This is potentially an issue because, as the warm quadrupole change their position with respect to the cold sections due to temperature effects, there could be an orbit drift with respect to the collimator jaws which cannot be compensated by the orbit feedback. A. Ferrari said that this study would require 2-3 weeks depending on the complexity of the geometry.

▷ TCT heat load

A. Bertarelli proposed to study the halo loads at the TCT. The design is obviously frozen but it could be nevertheless interesting to know if problems have to be expected.

A. Ferrari agrees however comments that he did not discuss IR issues because he assumed that they are being addressed by the US-LARP colleagues. The same argument apply to the study of BLM calibration against TCT damage thresholds, which was included in the last action item.

▷ FLUKA to ANSYS interface

A. Bertarelli also asked to set up a standard interface between FLUKA and ANSYS in order to ensure a full compatibility between the new FLUKA models to come.

In conclusion, A. Ferrari summarized his presentation by saying that the plan for future FLUKA studies will require additional iterations among the people of various teams. In some

cases it is difficult to get the global picture required to come up with a detailed “shopping list” for the work to come. A detailed road map should be agreed at most within September.

Among the most critical points, one can list: (1) need of a time-line and a working plan for the Phase II studies; (2) decision upon the need of setting up the IR3 FLUKA model; (3) prioritized list of commissioning and failure scenarios worth the FLUKA studies and (4) agreement among the collimation and dump teams on the IP6 simulations. The people involved should get together to agree on these issues. Experimental region issues were not discussed because that are under the responsibility of external collaborators.

S. Redaelli asked why the ion studies were not discussed. A. Ferrari replied that these studies are being addressed in separate meetings with the ion colleagues. J. Jowett commented that R. Bruce is working on setting up FLUKA simulations with ions. Discussion are also on-going with B. Goddard concerning IP6 simulations. S. Redaelli commented that these studies should also be presented at the collimation working group.

Followup after the meeting (19/07/2006): Based on the discussions of these meeting, a prioritized list of action items was set up by R. Assmann, S. Redaelli and M. Brugger and sent out for comments to the people involved. This will be discussed in detail at the next meeting of the collimation working group, after the summer break.