

Geneva, 10 December, 2001

CERN Meeting on Collimators and Absorbers for the LHC Beam

The LHC collimation system is designed to passively protect the cold aperture in the LHC against energy deposition from direct particle impacts. Protons will be lost at the aperture limitation due to regular processes (beam-beam, diffusion, halo) and irregular events (failures). Even for regular losses of beam particles a cleaning efficiency on the order of a few per mille must be ensured. The high power of the LHC beams imposes many challenges for the design of the LHC collimation system.

In the recent LHC beam instrumentation review there was a general agreement that the robustness of the present collimation system should be improved in order to withstand the expected particle losses from known failure modes, e.g. asynchronous LHC beam dumps, and other failures.

At CERN, a large expertise in the field of “targets”, “absorbers” and “collimators” exists. The aim of the meeting is to confront experts in the field of “targets” and “absorbers” with the specifications for the LHC collimators that are derived from accelerator physics and operation.

We therefore propose to address the following questions in a one-day meeting:

- What collimators / beam absorbers can stand the impact of part of LHC beam in case of equipment failure?
- What collimators can stand the heating by continuous loss of particles? What are the consequences for the beam intensities and lifetime?

Proposed date and time: Friday 25th January 2002, 9h-18h

Location: B. 40, R. 5-A01

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More on the LHC collimation system: <http://www.cern.ch/lhc-collimation>

For evaluating the number of participants (the conference room is for about 45 persons), please confirm your participation, and send requests and proposals to us. In particular we would welcome:

- Proposals for short talks (10-20 min).
- Proposals for discussion topics.
- Proposals for other experts to be involved

Please see the preliminary lists of discussion topics and distribution below.

Topics to be discussed:

Specifications

- Specifications for primary collimators
- Specifications for secondary collimators (could be different from primary collimators)
- Requirements on collimator remote control for operation.
- Overview on irregular beam loss at the collimators (failure scenarios)
- How many collimators are critical? All? Or only a subset?

What materials should be used for the jaws?

- Mechanical properties
- Thermal properties
- Nuclear properties

What geometry should be used for the jaws?

- Shape
- Rectangular blocks, other shapes, is a Sandwich structure advisable and possible?

Cooling of the collimator jaws

- Active cooling
- Passive cooling

Radiological aspects for collimators

- Doses at the collimators
- Induced activity

Tools for studies of collimator design

- Nuclear cascade codes
- Codes for the calculation of mechanical stresses
- Codes for the calculation of thermal effects

What has been done / is being done at CERN outside the LHC collimation studies?

- Other absorbers for the LHC (TDI, absorbers in the dump area)
- Targets for other existing / planned machines (SPS beam dump, Neutrino Grand Sasso target, targets for Neutrino factories, ...)
- Collimators at SPS and LEP
- Others?

Experimental validation of collimator design choices

- at the SPS
- at the PS
- outside CERN

The meeting will include several talks, and should allow for ample discussions. Brainstorming is encouraged, and we should be prepared to discuss alternative ideas (scattering foils, crystals, etc.).

Other aspects related to the design of the collimators should be kept in mind, such as cost, impedance of the collimators, impact on the machine layout.

Distribution list

- Members of the LHC Beam Cleaning Study Group (<http://www.cern.ch/lhc-collimation>)
- L.Evans DG/DI
- S.Myers SL/DI
- V.Mertens SL/BT, H.Schmickler SL/BI, F.Ruggiero SL/AP
- J.P.Koutchouk, B. Dehning SL/BI, L. Bruno, S. Péraire, B. Goddard SL/BT
- D.Brandt, L.Vos SL/AP
- T. Kurtyka, R.Valbuena EST/ME
- C.Johnson, J. Lettry, K.Schindl PS/PP, H.Schönauer PS/AE
- P.Sievers LHC/MTA, P. Bryant AC/TSC
- M. Brugger, S. Rösler, G.Stevenson TIS/RP
- P. Strubin LHC/VAC
- I. Baishev IHEP/Protvino
- D. Kaltchev TRIUMF
- N. Mokhov FNAL
- SL/EET