

# HL-LHC Collimators: Design, Engineering and Prototyping #17 Minutes

Thursday, 7<sup>th</sup> February 2018

30-6-019

Attendees: A. Bertarelli (AB), F. Carra (FC), G. Cattenoz (GC), L. Gentini (LG), A. Lechner (AL), C. Bahamonde (CB), I. Lamas (IL), E. Rigutto (ER), M. Calviani (MC), M. Pasquali (MP).

## AGENDA:

- Approval of minutes from previous meeting and review of action list;
- Report from brazing task force;
- Update on developments pertaining lead screws;
- Update on design of passive absorbers for IR7;
- Fluka calculations on the passive absorbers in IR7;
- Thermal calculations on passive absorbers for IR7 magnets;
- AOB.

### 1) *Approval of minutes from previous meeting and review of action list*

Minutes checked and approved.

### 2) *Report from brazing task force*

ER reports that the new procedure followed to braze glidcop and nickel alloy featuring one additional outgassing cycle delivered good results: ultrasonic scans highlighted good homogeneity of the brazing, while successive inspection cuts put in evidence a low amount of porosity. More importantly, no blisters have been observed on the surfaces. The next foreseen step is to repeat the brazing with a specimen twice the size. As for the nickel bath, ER states that the equipment currently in use is not able to prevent the development of deposits in the bath: a filter will be added during the next tests. In case of ineffectiveness of such measure, a new larger equipment to perform the nickel bath will be bought.

### 3) *Update on developments pertaining lead screws*

LG reports that no working solution for non-lubricated screws has been found so far. As planned, KSK screws have been sent back by the supplier: meant to be cleaned, they turned out to be still lubricated; moreover, no detail regarding the implemented cleaning procedure has been given by KSK. The next foreseen step is to test two non-lubricated screws by Kugel Motion. In addition to this, LG will be visiting a new screw supplier (Rollvis) in the next days to perform additional tests on dry screws. As for lubricated screws, new tests are planned to qualify UMBRA screws.

IL reports that EN/STI will introduce a new version of the screw testing software so as to be able to reduce the tests duration. Moreover, he states that according to a conference in Brescia he attended, the product currently used to lubricate screws (Santovac) was shown to undergo important deterioration under the effect of particle radiation. A survey of lubricants available in commerce with higher performances than the one currently employed (Santovac) when subject to radiation is required (**action L. Gentini and the Leadscrews Taskforce**).

4) *Update on design of passive absorbers for IR7*

LG shows a new possible design for the passive absorbers encompassing 2mm thick heating jackets. They will be placed before and after the magnets at IR7: given that the two beam pipes have a different shape of the cross-section, the correct shape of the shielding allowing the beam pipes to pass through must be checked (**action L. Gentini**). AL states that according to his knowledge, the beam pipes onto which the shielding should be installed should have the same cross-section.

AB and IL suggest modifications of the proposed absorber design to ease its installation and to prevent it from impacting the beam pipes during the installation phase (**action L. Gentini**). IL propose to schedule a HiColDEM meeting specifically aimed at discussing the design, manufacturing, transport and installation of the absorbers.

5) *Fluka calculations on the passive absorbers in IR7*

CB reports that with the absorber design featuring a part in between the two pipes, a decrement from 1.5 MGy to 0.6 MGy was observed in the radiation exposure delivered to the magnets. The new design now fully respects the specification given by the project leader, e.g. a shielding equivalent or better than what provided by the magnet. AL reports that the beam intensity to be taken into account should be  $8.8E11$  p/s instead of the previously considered  $7.8E11$  p/s.

6) *Thermal calculations on passive absorbers for IR7 magnets*

MP reports the results of thermal simulation carried out on the passive absorbers in their present configuration: maximum surface and bulk temperatures of  $T=128C$  and  $T=155C$  have been obtained. Such simulations have been carried out considering a constant load (1h BLT) of  $7.8E11$  p/s: new simulations taking into account a 0.2 BLT load scenario considering  $8.8E11$  p/s as peak intensity should be rerun (**action M. Pasquali**).



### AOB:

- Nothing to report.

### ACTIONS

- Prepare a new design for the absorbers introducing the modifications suggested during the HiColDEM #17 meeting (**action L. Gentini**);
- Perform a survey of lubricants available in commerce with higher performances than the one currently employed (Santovac) when subject to radiation (**action L. Gentini and Leadscrew Taskforce**);
- Check the correct shape of the passage for the beam pipes to be implemented in the new absorbers design (**action L. Gentini**);
- Run simulations on the present passive absorbers design with updated load features (**action M. Pasquali**).