Minutes of 81\textsuperscript{th} Collimation Upgrade Specification Meeting

Participants: G. Azzopardi (GA), R. Bruce (RB), F. Cerutti (FCe), H. Garcia Morales (HG) (scientific secretary), A. Lechner (AL), D. Mirarchi (DM), M.Patecki (MP), E. Quaranta (EQ), S. Redaelli (SR) (chairman), A. Rossi (AR), R. Rossi (RR), J. Wagner (JW)
Remote: M. Fitterer (MFit), S. Tygier (ST), G. Stancari (GS).
Indico event [here].

1 Actions

Actions from this meeting:

- CB for the FLUKA team: simulations with elliptical beam pipe between TCAPs and thicker masks.
- SR: organize meeting with magnet team to iterate on the radiation limits for MQWs.
- SR and JW: follow up hollow e-lens simulations, reproduce previous results.

2 Update on TCAP simulations (C. Bahamonde) [slides]

2.1 Summary of the presentation

- CB presents the results of the simulation of improved passive protection of the warm magnets of IR7 after LS2. This study aims at finding a proper passive protection solution for the new layout where one MQW module will be removed: it is planned to remove MQWA.E5 of both beams to gain 2 spares of these magnets that are heavily exposed to radiation. The installation of tungsten masks (shims) in all warm quadrupoles coils are foreseen, but additional passive collimator absorbers are needed to provide adequate shielding of the magnet.

- CB shows the radiation dose of the different warm magnets as estimated at the end of the HL-LHC operation, for an integrated luminosity of 3000 fb\(^{-1}\). As a guideline from the magnet team, the coils must absorb less than 0.1-0.5 MGy while the spacers should absorb less than 0.05-0.1 MGy. CB also shows the loss profiles at the different elements.

- CB presents the different options considered for protecting the warm magnets with tungsten masks and the corresponding peak doses of the most exposed magnet (MQWA.D5).

- CB concludes that the best option is to protect the magnets with three TCAPs as they are currently designed although the dose in the magnets is not as low as if the E5 module was not removed. Further studies will include thicker masks and new absorber design (Action: CB for the FLUKA team).
2.2 Discussion

- SR asks about the constraints on doses on spacers. CB replies that the damage limit is about 10-15 MGy. AL adds that this is not very radiation resistant. From the magnet team, there is a clear statement that these spacers, which represent the weak point of the magnets, cannot be changes.

- SR asked about the aperture between the two TCAP. Following the reply by CB that a round pipe of 80 cm diameter is used, SR asks to simulate the case with elliptical aperture with the same dimensions as that of the TCAP. This should be better for impedance and perhaps also for passive protection. (Action: CB for the FLUKA team)

- In the discussion it was pointed out that one should look at the transverse distribution of loss profiles on the magnet corss section in order to understand if limitations come from losses close to the beam pipe or from losses at larger amplitudes.

- SR comments that in the present condition we clearly do not meet the required specifications. In the best layout with 1 new TCAP added, we miss about a factor 2. He proposes to organize a chat with the magnet team (P. Fessia) and request them an iteration on the given limits (Action: SR). FC suggested to have this after the new simulations with elliptical beam pipes are completed.

3 Hollow electron lens simulations (J. Wagner) [slides]

3.1 Summary of the presentation

- JW presents the status of the hollow electron lens simulations, after recalling the basic features and goals of the simulations. The halo is composed of 10000 particles distributed uniformly between 4 and 6σ. The HL-LHC v1.0 optics is used with presqueezed $\beta^*$ = 60cm, without octupoles and without errors for 100000 turns.

- In all the cases simulated, no losses were observed.

- SR commented that the simulation setup seem to be still in a preliminary phase, as results are qualitatively different than what was observed in previous simulation works (V. Previtali, H. Rafique and more recently MFit). A detailed follow up off line is needed (Action: JW and SR).

4 A.O.B.

In response to a question by SR, GS announces that the CERN hollow gun underwent first tests at FNAL. Its vacuum behavior is good. In preliminary tests, the gun produced 4.2 A at 10 kV (design = 5 A). This is an excellent results for a first preliminary check!