Minutes of 60th Collimation Upgrade Specification Meeting

Participants: R. Bruce (RB), H. Garcia (HG), (scientific secretary), P. Hermes (PH), R. Kwee (RK), A. Mereghetti (AM), D. Mirarchi (DM), S. Montesano (SM), S. Redaelli (SR) (chairman), A. Rossi (AR), R. Rossi (RR), E. Skordis (ES), G. Valentino (GV) M. Fitterer - (MFit) F. Andrisani - (FA) F. Galluccio - (FG)
Remote: T. Markiewicz (TM), P. Theodoropoulos (PT)

Indico event [here](#).

1 Actions

Actions from this meeting:

- AR: follow up integration studies for e-lenses in IR4
- Verify layout in IR7 for BLM installation for crystal collimators.

2 Status of LHC tune ripple studies at 450GeV (M. Fitterer) [slides]

2.1 Summary of the presentation

- MFit presented preliminary simulation results concerning tune modulation for halo removal. Since electron lenses will not be available before LS2, the two techniques for halo control that are available during Run 2 are tune modulation or ADT excitation using the existing hardware.

- MFit summarizes the work done by some other people also presented in
  - R. Bruce, Status of halo excitation studies
  - R. Bruce, MD plans for active halo control

- MFit shows the evaluation of the tune footprint at injection using 10 A octupole current using MAD-X.

- RB also points out that the 10 A octupole current were determined empirically.

- MFit explains that DA simulations are not very conclusive regarding the dependence on the frequency.

- SR explains that if DA goes down to 6σ nothing would be seen.

- MFit gives some ideas for further studies:
  - Repeat simulations for a tune shift of 10⁻⁴.
  - Redo FMA.
  - Check diffusion plots.
  - Survival plots and DA vs. turns analysis.
2.2 Discussion

- SR comments that the present simulations cannot be used as immediate input for the tests in MD2 as the conclusions based on DA indicate that nearly no effect should be seen.

- RB says that even if simulations are not conclusive, one can try it using well known knobs.

- RB explains that a deconvolution of the contributions from the power supply and the magnet frequency is required.

- SR stated that these simulations will be followed up within the collimation team by J. Wagner who started a PhD on active halo controls. He announced that Miriam was hired as US-LARP Toohig fellow and will join hollow e-beam studies at FNAL, so she will remain involved in these studies. SR congratulated MFit for her new post.

3 Report from SPS crystal MD with LHC goniometers (R. Rossi)

3.1 Summary of the presentation

- RR explains that the UA9 Experiment in SPS is used to test the principle of crystal-assisted collimation. RR explains that during the data taking in July a prototype piezo-goniometer with the same functionality as the goniometers installed in LHC has been tested.

- RR concludes that the piezo-goniometer is reliable enough for standard UA9 operation in SPS and this result is promising for the operations in LHC.

- On the other hand, RR pointed out that finding the channeling orientation of the crystal took a long time, as the angle was off by about 6 mrad compared to what was expected. A new alignment procedure was used before the installation in the accelerator and this may be the source of the poor evaluation of the crystal initial orientation.

- RR presented the results achieved in term of beam loss reduction for the crystal tested (i.e. the comparison of the beam loss rate in amorphous and in channeling orientation). These results are not representative for the typical performance in SPS, because the length of the crystal was the same as the crystals prepared for LHC (i.e. it was not optimized for the SPS beam parameters). Also, the expected performance in LHC cannot be deduced from this test.

- RR explains the next steps that will be addressed at the SPS: upgrade the control software to increase the stability of the rotational stage during linear motion and test the reproducibility of the crystal positioning, knowing the crystal CH orientation.
3.2 Discussion

- SR comments that there is no reason to not to go for tests in the LHC. He recalled that the test at the SPS with the LHC-type goniometer, designed to achieve a 1 urad angular stability, was a prerequisite to perform the MD at the LHC.

- SR: The problem encountered with the absolute angle of the crystal relative to the beam is worrisome in view of the LHC tests. Adequate time has to be foreseen to find channeling if the same problem occurs at the LHC.

4 Update on HL integration studies for WP5 (A. Rossi)

4.1 Summary of the presentation

- E-lens implementation requires round beams. AR determines the positions around IP4 where both beams are round for LHC collision at 40 cm and HL-LHC. First, the beam size is calculated using a linear approximation and secondly dispersion and beta beat is introduced.

- The exact location of the round beam optics is displaced from IP4 and closer to D3. AR explains that the dogleg is crowded and little space is available for e-lens implementation or in the place where there is some room to place it, the beam is not fully round.

- AR presents a first estimation of the available space in IR1/5 to locate TCTP+TCL between D2 and TAXN and it is not clear whether they fit transversally.

4.2 Discussion

- AR explains that more checks are required to evaluate the actual space available. She is following this up together with the HL-LHC integration team.

- RB comments that probably there is chance to rematch the optics in IR3 region. In IR4. SR commented that this aspect will be investigated once we have a clearer solution from the integration point of view. Now, are not yet ready to provide clear constraints to the optics team. This will have to wait the integration work mentioned in the previous point.

- SR suggests to send the available space table to Ricardo de Maria. AR pointed out the request from the optics team to move the TCT4 on the other side of the D2.

- RB explains that TCT could be moved but not TCL. SR recalled that this option has been on the table for a while. For the present baseline, he prefers to study in detail the integration in the TAXN/D2 and then consider the movement of the TCTs only if there are problems. He also points out that the present energy deposition studies on the D2 where done with TCT at positions that contribute to the D2 shielding.