Minutes of the 35th Collimation Upgrade Specification Meeting 21st of March 2014

Participants: C. Adorisio (CA), A. Bertarelli (AB), L. Esposito (LE), P. P. Granieri (PPG), J. Jowett (JJ), A. Lechner (AL), A. Marsili (AM) (scientific secretary), D. Mirarchi (DM), S. Redaelli (SR) (chairman), B. Salvachua (BS), C. Tambasco (CT).
Remote: M. Serluca (MSe).

Indico event here.

1 A. O. B. (S. Redaelli)

SR gave a short description of the next LARP annual collaboration meeting, which will take place in BNL, and presented the schedule (figure below). This meeting mainly concerns development on the LARP side, so only a few CERN people would attend. SR gave a list of the proposed talks and discussion.

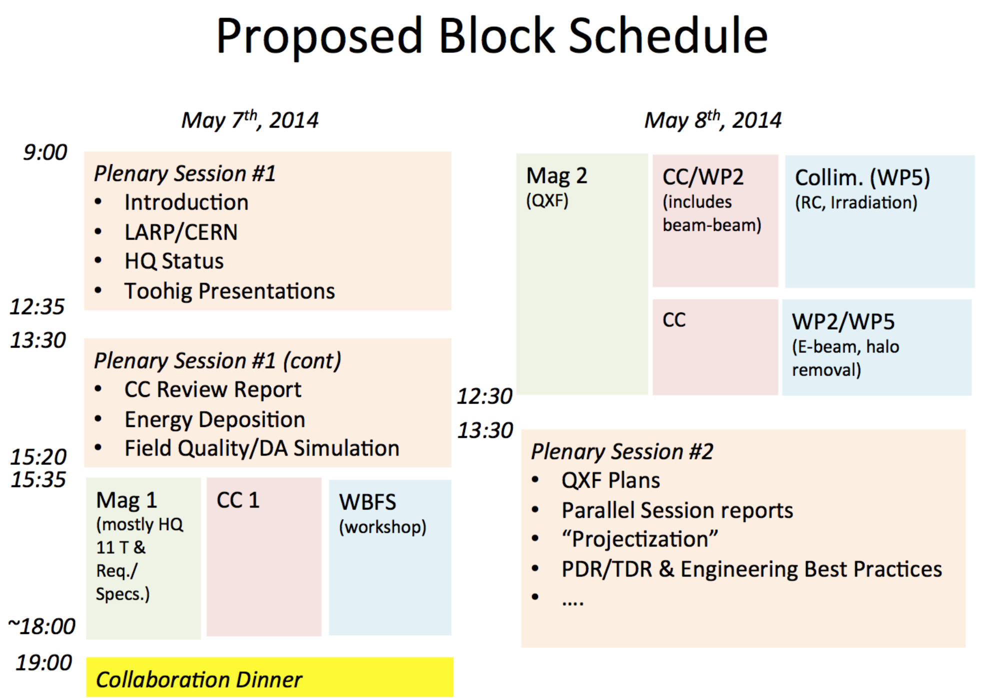

Figure 1: Schedule of the next LARP annual collaboration meeting.

The next ColUS meeting will be about the hollow e^- lens. In other related businesses, the visit of T. Markiewicz for the rotating collimator must be arranged. [**Action: team**].

2 BE note on TCL scans (A. Marsili)

Slides are available here.

2.1 Summary of the presentation

AM gave two short presentations about the TCLs: one presenting the BE note describing the TCL scans in the LHC in 2012, and another one giving an update on the comparison of simulations performed with FLUKA and SixTrack.

AM presented the TCL scans: the collimators are opened from $10\,\sigma$ to $60\,\sigma$, then closed. The signal of different BLMs (after normalisation by luminosity) is plotted versus the gap. The ratio between the losses for the two extreme positions was calculated for each measurement. They were gathered to produce an average ratio profile for the four TCLs, showing that they provide a protection by decreasing the losses downstream by a factor up to 50 at the Q8.

The plots of normalised BLM signal versus TCL gap show the excellent reproducibility of the measure, as well as the setting at which the losses at each element start increasing. This is a good indication of the maximum possible setting to protect each location. The measurements showed that, even though the two sides of each IR are supposed to be symmetric, and the two IRs very similar, the measured losses of equivalent BLMs can be very different. The should not be assumed to be similar. The measurements showed that the elements most further away (Q8) are only protected for the smallest values of the settings ($10 - 15\,\sigma$), whereas elements closer to the TCL remain protected for higher values of the settings (up to $50\,\sigma$ at Q5).

AM presented the results of asymmetric scans, where only one jaw was moved at a time. They illustrate the fact that the losses are mainly dispersive: only one jaw has a strong effect, corresponding to the side where the particles with $dp/p < 0$ will be lost. The ratio between the losses for TCL "out" and TCL "in" show that the active jaw provides a protection similar to the average of the symmetric scans. This could be useful to reduce the impedance if needed: only one jaw can be used.

In conclusion, these measurement provided useful results on the reality of the machine. All plots and data are available in the note.

3 Comparison of debris simulations between SixTrack and FLUKA (A. Marsili)

Slides are available here.

3.1 Summary of the presentation

AM presented the last results in the comparison of debris tracked by FLUKA or SixTrack. This will be part of an IPAC article. The first results were quite different, but the reasons have been understood and corrected. There was an error in alignment of the TCL in FLUKA simulations. Initially, the distribution of debris used in SixTrack had a cut in energy which was too tight (10%). These distributions have been regenerated and are now equivalent (though different in statistics).

AM presented the two proton loss maps with no TCL, as generated by FLUKA and SixTrack, in units of p/m/s. They show a good agreement, especially for the DS where the losses correspond exactly (starting at Q7). Losses before Q5 were not simulated by FLUKA. SR added that losses down to D2 should maybe be included. The next step for SixTrack studies would be multi-turn tracking, and scans of crossing angle for the magnet location where results are reliable.

3.2 Discussion

RB asked about the elastic proton-proton interactions in the generation of the debris, which are relevant for multi-turn studies. LE answered that the model has been developed, but is not yet included in DPMJet yet.

4 Steady-state cable quench limits of the 11 T dipoles

Slides are available in pdf and pptx.

4.1 Summary of the presentation

PPG gave a first estimation of the quench levels in cables of the 11 T dipoles, extrapolated from measurements on MQXF magnets and assumptions on typical duration of energy deposition. The question of the duration was raised. The results are given for an energy deposition of 10 s (for protons), which should be close to the steady state.

The results from simulation codes are not available yet. The cables used in the measurements performed in 2012 are different from the ones of the 11 T dipole, as is the electrical insulation, the absence of mica glass and the fact that the cables are unreacted.

Nevertheless, these results can be used to determine how much heat can be extracted, knowing the temperature of the bath. The heat extraction is only taking place through thermal conductivity. If there is no other limit on heat extraction, the quench level of the magnet will be the one of a single cable.

The quench limit was estimated to be around 110 mW/cm^2, which may be a bit optimistic. Measurements will soon be available, as well as the results of simulations. This also include transient cases.

4.2 Discussion

SR explained that the loss simulations showed that the peak of energy deposition, in the 11 T dipole, was as the same level as the previous case for the whole 8.3 T dipole. If the quench level was lower, this could have become an issue.

Since PPG will be leaving CERN, SR asked who is appointed to the further studies [**Action: team**].