MPP meeting 27 May 2011

Original agenda:

1) Quench test with LHC wire scanner: Update on FLUKA simulations (A.Lechner) – 20 min
2) Stronger Aperture Kicker for measurements of dynamic aperture (F.Schmidt) – 15 min
3) ADT – Update on most critical failures + interlock ideas (W.Hoefle, D.Valuch) – 20 min
4) Experience with the new BPF + proposed modifications for next TS (B.Todd, M.Gasior) – 10 min
5) AOB

Present:

B.Todd (TE/MPE), B.Dehning (BE/BI), M.Solfaroli (BE/OP), R.Schmidt (TE/MPE), F. Schmidt (BE/ABP), S.Wagner (TE/MPE), A.Siemko (TE/MPE), M. Zerlauth (TE/MPE), S.Wenig (PH/ADO), E. Carlier (TE/ABT), E. Nebot (BE/BI), F. Burkart (BE/ABP), A. Lechner (EN/STI), A. Nordt (BE/BI), V. Kain (BE/OP), A. Butterworth (BE/RF), A. Ferrari (EN/STI), F. Cerutti (EN/STI), J. Uythoven (TE/ABT), J. Wenninger (BE/OP), R. Jacobsson (PH/LHCB). W. Hofle (BE/RF), J.Blanco (TE/MPE).

Minutes:

ADT – Update on most critical failures + interlock ideas (W. Hoefle, D. Daluch)

Wolfgang presented an updated overview of the most critical failures of the transverse damper system (ADT) that was already introduced in 2005 (MPP review). The main idea is that the ADT can induce beam oscillations very rapidly. For the case of the beam 2 vertical ADT, four turns are sufficient to move the beam 1sigma (if kicked on the same tune). **Rudiger**: is it possible in a single kick to kick more than expected? Wolfgang: in case of sparking inside the tank you can get up to a 20% stronger kick.

He showed a summary of the most relevant issues since 2009. Jorg pointed that for all those cases either the BLM's or collimators catch the beam. **Markus** commented that a system settings check should be added to the Pre-Operation Checks. **Jorg**: not all the settings can go on MCS because some of them need to be trimmed.

Wolfgang explained that one of the worst case scenarios is a badly injected beam (5sigma). **Verena & Jorg**: if you inject at 4sigma you scrape it and then dump immediately. There is another level of protection for large injection oscillation: pick up's.

Wolfgang asked to check the phase advance between the primary and secondary collimators and the kickers. Jorg replied that you cannot guarantee the same phase advance when you change the optics.

Rudiger said that it would be good to have another system, redundant to the BLM, like a fast beam motion. Just to look into the details for the feasibility for the different failure modes. **Jorg** explained that a system like this has been studied on the SPS but it has never been put into operation due to the large number of false triggers. **Markus** agreed that a redundant system should be pursued.

Stronger Aperture Kicker for measurements of dynamic aperture (F. Schmidt)

Frank made a detailed presentation about what is the dynamic aperture (DA) and why a stronger aperture kicker should be consider for the LHC. Dynamic aperture is a very important parameter that cannot be precisely determined, 2x factor from experience, by tracking programs (MAD). Studies of the new HL-LHC rely on a precise dynamic aperture calculation of the LHC. He explained why heating a beam is not best option to put particles at high amplitudes. The actual aperture kicker has a 6 sigma amplitude for a single kick, which is a factor two below the predictions for the LHC DA (11 sigma).

He aims to have a 3E9 proton beam with 1.5um normalized emittance. Jorg pointed that 'safe beam' is not safe and still has damage potential. The global consensus was to have the power supply physically disconnected from the aperture kicker so that you need an intervention every time you want to use before an MD. Rely on EIC for physical protection that the kicker is only used with 'safe beam'. **Rudiger** added that the LHC review of 2005 defined the aperture kicker as an unjustified risk. He concluded that "we have to do it in a responsible way".

Quench test with LHC wire scanner: Update on FLUKA simulations (A. Lechner)

Anton presented an update of the Fluka simulations of the LHC quench test with wire scanner. The updated study uses a more accurate geometry in particular for the cryostat model, interconnections and BLM position and orientation. This mainly affects the secondary shower build-up and also produces shielding effects.

The new study shows an improvement in BLM's 1,4 and 8, that are the ones at the beginning of the cryostat or after an interconnect. Absolute dose error within ±30% (in previous study it was relative error).

Francesco commented on the results that a significant fraction of the BLM 1 signal is not coming from 'inside the pipe' therefore not contributing to heating of the magnet's coils (BLM signal not correlated with coil heating). But for BLM 2 the signal is strongly correlated with coil heating.

Markus: what quench limit is expected for the D4 in the shown plot? **Anton**: it is complicated because of the loss time pattern. For this you have to consider the energy time integral until the quench but for this plots we have considered it until beam dump. Arjan is working on it.

Jorg commented that it would be interesting to redo the experiment with more bunches and with the new wire scanner (20cm/s).

Rudiger asked the question about how much reduction in energy deposition you get in the dispersion suppressor region if you insert a thicker beam pipe, like the ones of the triplets, in IR3. It becomes interesting if you get a factor of 2 reduction at least. **Andrej** asked how the heat would be extracted. **Rudiger** answer that it should go into the 4.5K system.

Finally **Anton** presented an outlook of an upcoming FLUKA benchmark using stable beam data of BLM's around triplet right of IR1. The relative pattern is well reproduced but there is a systematic offset that needs to be understood. **Alfredo** commented that this error can come from the luminosity value used or even the cross section of the physics.

Experience with the new BPF + proposed modifications for next TS (B. Todd, M. Gasior)

Ben briefly introduced the SMP beam present flag generation. He showed how the actual system that uses a voting procedure of 2 out 3 is giving a false sense of security. The signal coming from the FBCT's is very unreliable as shown in the presentation; the system was not meant to do this, and thus is in fact hampering the availability and the safety of the BPF. To correct for this Ben proposes to leave the 2 out of 3 voting mechanisms but disconnecting the cables from the FBCT. The modification was accepted; the SMP system is made fail safe.

Ben also proposed to double the attenuation for the BPM pickup signals to 2e9. **Jorg** agreed as this is consistent.

Rudiger asked if the BCT signal could be used for the beam life time measurements. The system needs a very stable signal up to 1s. **Marek** answer that it is not possible to measure intensity because the signal does not scale linearly with intensity. But they are designing a new system for collimators that can measure intensity with a resolution of 1E6 in 1s.

AOB (various + E. Nebot):

Markus mentioned that during the 08:30 meetings a few colleagues from the experiments mentioned that they would like to be informed about BLM threshold changes, especially about the ones close to experiments (TCTs,..).. Jorg commented that collimators are a priori not part of the active protection systems.

Revision of BLM thresholds affected by UFOs around MKIs (E. Nebot)

Eduardo showed changes of threshold for the BLM's affected by UFOs around MKI. He analyzed 7 dumps and found the limiting monitors for BLMs at MKI, TCTH and MQY. MKI the master factor: 0.1 -> 0.5. TCTH master factor 0.1 -> 0.2 to still have some flexibility. MQY RS01-RS02 and RS03-RS05 have been increased by 3 and 5 respectively due to UFOs; RS07-RS10 has been reduced by 3 due to the quench test. In addition a global correction value of 8.4 has been applied to all RS for MQY. Monitor factor increased in the past 0.5 -> 1.0.

These changes will be documented in an ECR (being prepared).