MPP meeting 3 September 2010

Original agenda:

- Updates on the 'events' (J. Wenninger).
- Search for below-threshold 'events' (E. Nebot Del Busto).
- Updates on quench levels for MBs (A. Verweij).
- Collimator phase coverage (T. Baer)

Present:

R. W. Assmann(BE/ABP) , N. Bacchetta(PH/UCM), T. Baer(BE/OP), J. Blanco(TE/MPE), B. Dehning(BE/BI), E.B. Holzer(BE/BI), R. Jacobsson(PH/LHCb), E. Nebot(BE/BI), L. Ponce(BE/OP), A. Verweij(TE/MPE), M. Sapinski(BE/BI), R. Schmidt(TE/MPE), S. Wagner(TE/MPE), J. Wenig(PH/ATLAS), J. Wenninger(BE/OP).

Minutes:

Updates on the 'events' (Jorg Wenninger)

Jorg presented new information about fast loss 'events' since the presentation given on the 13th August. The number of events has increased up to now from 4 to 7. Special attention to the fifth event that happened at the same time a roman pot was moved. The movement could have triggered the fall of a 'dust' particle into the beam. The pot has been moved before and after several times without any problem. All of these events had occurred only in one half of the machine between sectors R3 to L7. It was commented if it really a piece of dust that gets ionized as goes through the beam and expelled, but is not yet proven that the losses are due to dust. The rise time, defined as the time from 10% of maximum signal to the maximum signal of the first running sum (RS01), seems to decrease with the intensity, but the peak losses are quite similar on every event. **Jorg** pointed out that if the BLM thresholds would have been raised by a factor of 2, could the beams might have been dumped. Studies concerning the thresholds are currently being done by **Arjan**. The thresholds are not going to be modified for the moment in order to capture more of such events. It is propose to use the wire-scanner to do a benchmark test for the events as it generates losses on the same timescale. **Jorg** pointed that if the frequency of these events increase with beam intensity operation will become problematic. **Ralph** commented that losses might scale with the intensity but **Jorg** replied that for the moment that is not yet clear.

Search for below threshold events (Eduardo Nebot del Busto)

Eduardo explained that the main motivation of his work is to gather more events similar to the seven already mentioned however with the signals below the thresholds. In these cases the beam was not dumped. He analyzed 11 fills from the 31st of July to the 10th of August looking for a specific pattern were at least one monitor signal on the RS05 is higher that 1% of the threshold and were at least three more monitors within 40m have a specific loss pattern. The following 'Running sum Ratios' must be fulfilled: RS05/RS01>20 and RS09/RS05 <0.8. The last requirement is that there must be losses on a primary collimator, namely, the signal on the ionization chamber has to be a factor of 10 over the noise level.

He found nine candidates that fulfil the requirements, specifically three with relatively high losses at the primary collimator. The future plan is to automate the procedure with every fill.

Barbara said that the data from the BLMs is stored in the measurement DB but only for 7days, and then only a reduced amount of data is kept in the logging DB. **Jorg** asked how long it takes to scan the data of a 12 hours fill. **Eduardo** answered that it takes about 10 mins on the logging DB. It was suggested to implement at trigger to collect these events into a separate DB. **Jorg** asked if it is possible to change the filters so if the losses exceed a certain value then to save the full data in the logging DB. **Ruediger** pointed that the logging database is not made for massive access and for that it would rather be implemented in a different format. **Ralph** suggested that in order to not overload it, data should be store locally.

A plot from **Tobias** shows a correlation between the integrated intensity and the fast loss events. He pointed out that with nominal beam intensity one event per hour is expected, assuming the scaling is correct. **Jorg** wondered if the intensity triggers the falling of the dust.

For future work **Eduardo** will look at the last fills with more intensity. The idea is to find the events between 1% and 10% of the threshold.

Updates on the quench levels for MBs (Arjan Verweij)

Arjan presented the QP3 code used to calculate the quench thresholds for the BLMs. He modeled it as a single strand with a length of half of the transposition pitch (considering large distributed losses and a high resistance between strands in the cable). The strand has been subdivided into 14 elements, were the first element is closer to the beam and corresponds to the thin edge of the s.c. cable. **Arjan** commented that for his calculation he takes the most critical cable in the magnet and ignores the others. Different values of field, losses,... are applied to each element. **Ralph** commented that the losses used for the model look much higher than we have had so far. **Ruediger** pointed that we are on the conservative side. The only assumption is the radial loss distribution. The model uses the resistivity, thermal conductivity and heat capacity of the different materials; it also considers infinite heat transfer to the helium of the voids up to a certain temperature when became gas and then zero heat transfer. **Ruediger** commented that for losses of many ten seconds the deposited energy would increase He temperature above superfluid. **Arjan** answered that this is the average along the cable and not the peak loss at the edge of the cable. A sensitivity analysis of different model's parameters confirms that for fast losses the only important input parameter is the heat capacity of the cable were for steady-state losses is the steady-state heat transfer from the conductor to the bath through the Kapton insulator. For the intermediate regime the model is sensible to the content of helium inside the cable voids. Results have been presented for 7TeV, 5TeV and injection energy.

Shall we modify BLM thresholds on the superconducting magnets? (Mariusz Sapinski)

Current BLM's thresholds are based on the Project Note 44 algorithm. The algorithm defines each BLM threshold as a function of the BLM signal, quench margin and the energy deposited in the coil. Three different time regimes are considered where the effective enthalpy and the energy deposited is calculated on a different way. It uses 8 parameters taken from GEANT4 simulations, thermodynamical models and analytical calculations. Using the new QP3 code this will be simplify to only three parameters.

There is one well known quench limit at injection where all the parameters were known (20mJ/cc). **Barbara** commented that after that the thresholds were rescaled. **Arjan** asked if the thresholds used on the BLMs are divided by a factor of 3 and if that could be the reason for the discrepancy on the three algorithms. Preliminary results show good agreement between Project Note 44 and QP3 @ 7TeV. At 450GeV and 3.5TeV there are differences between the code's results but it has to be noted that Project Note44 was focused on the 7TeV operation.

Experience shows that for fast losses we are more than a factor 3 from the quench level. **Arjan's** code indicate that we are underestimating BLM thresholds in the ms scale.

Ralph noted that years ago it was proposed to do some quench test. Every test is a mechanical shockwave for the interconnection. And if it can be excluded 100% that after a quench it would be needed to do a technical stop for repairs. **Ruediger** answered that an incident is never fully excluded, but the probability for damage is very small.

Collimator phase coverage (Tobias Baer)

Tobias presented the phase space coverage by collimators for a single turn particle. Different collimator settings were shown for each beam: at injection, after injection, 3.5TeV beta*=11m and 3.5TeV beta*=3.5m. Conclusions are that there is a total coverage by the primary and secondary collimators in point 7, the TCSG.4R6.B1 and the TCLI in points 2 and 8. In the vertical plane we are covered from injection collimators. **Ralph** pointed that the collimation system was made as a cleaning system and not as a protection system; it was not a design constrain as in that case three TCP collimator would have been placed in each plane. The maximum uncovered amplitude is 9sigma at injection, 9.5sigma after injection in the vertical plane B1 and 12.1sigma at flat top and squeeze in the vertical plane B1. **Jorg** commented that for ion operation it is foreseen to have the TSG fully out. **Ralph** said that the idea is not to set up all the collimators but only TCP and TCT. **Jorg** asked about the position of the TCLA? **Ralph**: replied that this still needs to be studied. The problem appears during setting up and at the same time an asynchronous beam dump happens.