Minutes of the 5th BLM Threshold Working Group Meeting January 27, 2015

Present: B. Auchmann, A. Lechner, M. Kalliokoski, O. Picha, V. Raginel, N. Shetty, E. Skordis

BLM Thresholds for IPQs and IPDS (O. Picha)

IPQ Thresholds

For IPQ locations, a detailed FLUKA study has been carried out by Nikhil for UFO loss scenarios. For this purpose, a geometry of 2 back-to-back MQYs was exposed to UFO-type proton-carbon-atom collisions. The location of the collision was varied between zero and 60 m from the MQY endplate. The BLM response and the energy deposition in the coils were computed. As for the BLM response, it was evaluated in 12 positions along the MQYs.

To compute BLM thresholds based on the above data, Ondrej selected a UFO location of 10 m, representative of the distance between an MKI and the downstream Q4. The adequate BLM position was selected. Quench levels were computed with QP3. The resulting thresholds for MQYs are very high. For all energy levels the electronic limit is reached in the low RSs. It is therefore suggested to use the dynamic-orbit bump (DOB) scenario as the base scenario. AdHoc factors are applied to the low RSs in order to avoid that new thresholds would be lower than pre-LS1 thresholds. In this way the empirical knowledge of Run 1 is taken into account, while computing thresholds in a manner altogether consistent with all other threshold updates.

The same DOB scenario is proposed for the Positions 1 and 2 of all other IPQs. Note that the Position-3 monitors of all IPQs were set to maximum during Run 1, since they are mounted away from the magnet cold mass and see higher signals. Ondrej presents before&after plots of MQM 1.9 K, MQM 4.5 K, and MQT(L) cases.

IPD Thresholds

Similarly to the IPQs, Nikhil performed a FLUKA UFO study with a geometrical model of an MBX (D1) magnet. Again, various UFO and BLM locations were simulated.

In order to produce thresholds that would not deviate too much from Run-1 thresholds, Ondrej selected the UFO location of 0 m. In this way, thresholds of the same order of magnitude are obtained. Other UFO locations would lead to drastically higher thresholds.

Rationale for Thresholds on MQW Magnets (V. Raginel)

Steady-State Losses

Vivien summarizes the relevant technical parameters of MQW magnets. The coil temperature near the water outlet is interlocked to stay below 65 degrees C. The dissipated power at nominal current and for the nominal water flow of 28 l /min is 19 kW for the MQWA option, and 14 kW for MQWB (same geometry but lower current).
Given the inlet water temperature of max. 30 degrees C, Vivien computes that at most a steady-state heat load of 54 kW can be extracted from the magnet before reaching the 65 degree interlock value. Subtracting the 19 kW Joule losses, a total of 35 kW of beam-induced power is allowable.
A discussion ensued whether for the evaluation of beam-induced losses Lefteris should integrate losses over the entire MQW magnet, in particular the including the yoke, or only on the coil. It was decided that Lefteris should compute both values, so that we can see how suitable they both are for meaningful threshold settings.
Also, Vivien showed that the power impinging on an MQW in the cleaning insertions for 240 kW impacting power on the TCP (design criterion of the collimation system) is ~7 kW at 3.5 TeV. A rough linear scaling to 7 TeV gives 14 kW, that might need to be deducted from the above budget of 35 kW.

Short-Duration Losses

Criterea for short-duration losses are derived from the TT40 experiment for the beam-pipe (1.9 kJ/cm^3), and from requiring that the coil temperature stays below 100 degrees C locally in the coil hot spot (0.21 kJ/cm^3).

Next Steps

In four weeks time, Lefteris and Vivien will give a presentation on FLUKA simulations and threshold estimates on warm magnets for Run 2.

Next Meeting

The next BLMTWG meeting will be on Tuesday, February 10, 10h30 in Bldg 864 1-C02. Topics will include

- O. Picha: New thresholds for ITs.
- E. Skordis: Overview of simulations for collimation thresholds.

Minutes by B. Auchmann (TE-MPE)