MPP meeting 29 October 2010

Original agenda:

- Quench tests at 450 GeV and 3.5 TeV (M. Sapinski)
- UFO at LHCb (R. Jacobsson - tbc)
- Analysis of orbit correctors settings (speaker to be defined)
- Operational orbit and COD interlock settings and OP experience (J. Wenninger)
- AOB

Present:

Matteo Solfaroli, Ruediger Schmidt, Bernd Dehning, Nicola Bacchetta (CMS), Arjan Verweij, Barbara Holzer, Markus Zerlauth, Jan Uythoven, Mario Deile (Totem), Marco Calviani, George Kourkafas, Ben Todd, Moritz Guthoff, Mirko Pojer, Mariusz Sapinski, Jorg Wenninger, Mike Koratzinos.

Minutes:

News (Jorg)

Jorg informed the meeting that the BLM thresholds had again been increased from a factor of 3 to a factor of 5 (arcs and dispersion suppressors). One BLM had been disabled. Bernd: this BLM is partially working, it should not be disabled – his proposal is just on increase its threshold.

Quench tests: preliminary analysis (Mariusz)

Mariutz showed the preliminary analysis of the quench tests from the BLM point of view.

There have been 5 quenches before September this year, and they were all ‘quenchinos’. Most in V plane, all in beam 1 at injection.

The October tests we performed creating bumps around Q14R2 which was equipped with special QPS electronics. There are three relevant BLM monitors: position1 is at interconnect, position 2 in the middle of the SSS, position 3 after interconnect. In slide 6: ‘electronic limit’ is actually the level when the electronics gets saturated. The red circles correspond to the points we have probed with the tests (40ms, 1s 10s). The solid line is injection the dashed 3.5TeV.

6 October test: Horizontal bump, inject and dump. Upstream MB quenched with no signal in the MQ. Losses started at 19mm bump. Vertical bump: MQ developed a resistive zone, but the nQPS (comparing the bus bar segment voltage with the magnet voltage) came first. A bus bar segment quench does not fire heaters. Signal at quench in RS09 (1.13sec) is 0.3Gy/s theoretically derived quench limit: 0.08 (factor of 3 between the two). Preliminary estimation of the quench level at injection is 1.3e10 protons/m/s

The 3.5tev tests were done 17 October. Veritcal bump, MQ quenched. RS10 (5.2sec) signal at quench: 0.004Gy/s theoretical level: 0.008 (factor of ½).

New code is being developed (QP3, Arjan Verweij) (slide 17 in red) is even higher than old code at running sums of 1sec.

This is work in progress. There is enough work here to occupy several people for months.

COD behaviour (George, Matteo)

In this combined presentation, Matteo first showed the analysis of corrector dipoles with the aim to spot any potentially risky behavior (for example, the development of an unnoticed closed bump). The analysis checks the kick strengths of all CODs per fill with a reference fill. Two snapshots are taken per fill (one just before the ramp and the other midway between the declaration of stable beams and the dump). All data are derived from the logging db.

Overall the orbit is very stable with only minor problems, when for instance a corrector's power supply failed. Its effect in this case is visible.

George then took over and showed the continuation of the analysis: George runs MADX with the difference of the COD strengths (actual minus reference fill) to derive a difference in orbit. The scheme is able to spot unexpected behavior. RMS differences grow but very slowly. V plane more stable than H and injection not as good as stable beams.

Software interlocking (Jorg)

On the same subject of CODs, Jorg presented his software interlocking scheme. There are three interlock types: global orbit; global COD; and local orbit interlocks. Most interlocks dump the beam, but some inhibit injection.

Global orbit interlock: compare entire orbit with reference. Tolerance: at injection: 1.2mm (1 sigma). Stable beams 0.8mm (2 sigma). 2 BPMs needed to trigger.

CODs interlock: kick reconstructed from PC currents. Global limit of out-of-tolerance CODs is currently 2. Tolerances are for injection: 12urad and for stable beams 16urad (H) 12urad(V).

Local orbit interlock: this is a new interlock (was introduced last week). Compare local orbit at injection regions with reference (4BPMs). There are issues with low and high intensity bunches – readings can systematically differ by >0.3mm.

TOTEM interlock: compare local orbit around TOTEM with reference (3BPMs) –dump if 2BPMs out of tolerance. Stability over past months is good: BPM readings do not change by more than 0.2mm around the reference.

Local orbit at DCDQ: compare local orbit around TCDQ/TCSG.6 with reference (2 BPMs). Dump if any BPM out of tolerance. Tolerance is 1sigma (2mm at injection) and 1.4sigma (1mm) at 3.5TeV. For nominal performance the tolerance must be pushed towards 0.5 sigma.

Operational experience: some false alarms. Above 450GeV no COD trigger; Up to August there were a few justified triggers but since September no more orbit dumps. (There is now enough beam in the tails that the BLMs always trigger first). So now orbit is second line of defense. However, at injection it is still very important, and we can still tighten our tolerance settings at injection. One idea is to introduce a state machine where all interlock info is processed (maskable at injection, not maskable for stable beams) – this is a longer term project, possibly for next year.

UFO at LHCb (Richard)

Richard showed the preliminary analysis of a very interesting event that happened close to LHCb two weeks ago (fill 1424). The LHCB BCM dumped. There was nothing special in the vacuum activity. There was a strange increase in Beam 2-gas events five minutes into the fill. 5 mins later there was another increase in halo rates. These kind of behaviour was never seen before. The BLM activity was a factor of 10 below threshold.

The LHCb dump was triggered by BCM upstream RS2 (80usec). The beam was then extracted within 120usec. No structure was visible in the diamon detectors (favouring vertical or horizontal losses). Rise time is typical of a UFO. Interestingly, LHCb recorded events during the 'UFO attack". There were a lot of parallel tracks indicating a big object and very far away (more than 50 m). LHCb is able to see a vertex for beam gas events 50m away. This is the first picture of a UFO. Ruediger pointed out that losses start in Q3 (which is about 50m away)

Meeting encourages LHCb to continue the analysis (angles, etc.)

More news (Jorg)

MPP page now has some interesting information from analysis of members (for example, list of UFOs, list of dumps…) – click on “MPP data 2010”.

There will be Machine Protection topics discussed in Chamonix (chaired by Markus) and Evian (chaired by Brennan)

There will be a wire scanner Quench test next week.