MPP meeting 19 June 2009

Agenda:

- Quench levels in busbar (A. Verweij)
- Plans for busbar quench simulations (J. Sancho Blanco)
- Single event effects in WIC during TI8 test (P. Dahlen)
- AOB

Present:

Richard Jacobsson (LHCb), Antonello Di Mauro (Alice), Mario Deile (Totem), Alick MacPherson, Markus Zerlauth, Benjamin Todd, Jan Uythoven, Jim Strait, Robert Appleby, Mike Lamont, Rosano Giachino, Rudiger Schmidt, Annika Nordt, Mariusz Sapinski, Massimiliano Ferro-Luzzi, , Jorg Wenninger, Daniela Macina, Siegfried Wenig, Walter Venturini, Juan Blanco, Pierre Dahlen, Mike Koratzinos

Quench levels in busbars (Arjan)

Arjan first indicated that it is more adequate to speak about Enthalpy margins than quench levels. Enthalpy is the energy needed to reach critical temperature in a superconductor. Arjan showed a few graphs of safe and unsafe areas for the magnet itself and for the busbar. Safe areas include areas where the quench is detected by the QPS system or when it does not propagate and dies out. The beam-induced quench of last September for example would have recovered, had the QPS system not been triggered. RB and RQ magnet graphs are not very different due to similar designs. The busbars have different shape than the magnets since the bus is mainly made of copper and resides in a low field (0.5 Tesla) region.

Problems are related to bad bonding between the copper stabilizer and the cable, and require to remain below some current (not defined in the talk) for safe operation. For the bus, when the bonding is good, the difference with the magnet is that the bus always recovers: 20 cm of bus bar for example can quench, the quench will not propagate, and the QPS will not detect anything.

Extra risks (not taken into account in Arjan's plots) include: situations where the QPS thresholds are not attainable; cases where for any reason the bus is heated up above 30-40K which will lead to destruction of the bus due to an avalance effect. As an order of magnitude, 1 Joule per cubic cm are needed to warming up the cable to 30K.

Busbar quench simulations (Juan)

Juan explained first that the most interesting cases had been identified to start the simulations: interconnection (or empty) cryostat and DFBs.

A FLUKA model of the empty cryostat exists, but the busbars are not part of the model. The model will be improved by introducing the busbars and the lyra, as the RQ lyras cross the plane of the beam. Along most of the length of the empty cryostat the beam vacuum chamber is surrounded by a series of lead (or stainless steel) 'boxes'. Those boxes were installed as radiation shielding on the request of RP. At the level of the lyra there is an interruption of the protection boxes, which could worsen the situation for the busbar (to be confirmed by the simulation) due to showers being initiated in the protection 'boxes'. Juan showed a draft Fluka model of the busbar which is nearly complete. The model has two BLMs along the whole length of the cryostat and one of the outcomes of the simulation would be to indicate where to install extra BLMs (if required). In principle there are empty channels to install extra BLMs. It is estimated that the model should be complete within about one week.

Due to the complexity of the DFB, the model will be simplified to make a compromise.

Single events in warm magnet interlock controller during TI8 tests (Pierre)

Pierre reported on an incident during the TI8 tests on the WIC system, the protection system of warm magnets. The WIC system includes a number of peripheral units to avoid excessive cable lengths. There are about 40 such remote units. All have been tested to a few times 100Gy in radiation tests in TCC2 (2002) and at PSI (with additional tests in 2009). It was observed that single event upsets appeared for doses of the order of 50 Gy.

The event during the TI8 tests: after a around 20 beams had been shot on a closed collimator jaw, a peripheral unit installed approximately 15 m downstream from the collimator lost its profibus address. This resulted in a normal action of switching off the converters for the transfer line and for the transfer line to the CNGS. No damage done and the magnets were always well protected. Such an event was never seen before (but there was never closing of the collimator jaws upstream). The radiation estimates from simulation are very low, around a Gy or less. No SEU was expected for such a low dose. R. Schmidt commented that the time duration of the pulse may matter. J. Wenninger mentioned another worrying coincidence: with the first 12 bunch extraction of 5E10 p/bunch, two BPM channels developed very large offsets (around -10 mm). In a mail after the meeting R. Jones indicated that for one of the BPM a short circuit of one of the electrode was found. The short could be repaired by a power pulse on the electrode. The case of the other BPM must be confirmed. It must be noted that the electrode have been recuperated from LEP BPMs.

The solutions to the WIC issue include: additional shielding, moving 40m upstream and/or decouple TI8 from CNGS operation. It could also be envisaged to change the interlock logic: in case of a loss of communication, the master PLC could try to reset the remote unit for a few second before shutting off the PCs.

For TI2 we cannot have the same problem as the chassis are all upstream of the collimators.

Various AOB (Jorg)

In SPS a dipole magnet with a 'near miss' was found due to low but continuous losses. The vacuum chamber has a deep groove due to a near miss that happened during 2008 or 2009. The magnet will be exchanged. For such incidents the BLM is not well placed – a known issue.

A new beam position interlock system is entering the commissioning phase at SPS. The new system has many advantages: no delays, no need to change gain, faster decision, etc.

For CNGS the interlock commissioning is complete. It is almost complete for TI2/TI8. The only issue that was encountered is a 2 ms timing jitter of the PC current interlock. The issue is being analyzed; it is not very serious since FMCMs protect all really fast circuits. The energy window of the Beam Energy Tracking System of the SPS extraction kicker was reduced to +-1.5 GeV. It could be further reduced to +- 0.8 GeV once the final SPS-LHC energy matching is done.

Transfer line interlock system will be changed for LHCb and ALICE as promised. For LHCb it is already done, Alice will be done before the TI2 test on 11/12 July.

For the vacuum interlock it was decided to remove the BEAM_INFO signal from the valve closure logic. An ECR will be prepared.

R. Jacobsson commented that some RF signals were swapped between beam 1 and beam 2. He suggested that we should look at possible consequences of such errors, and how to detect them.

Beam vacuum valves (Daniela)

D. Macina presented what she found out the day before the meeting about vacuum valves. She confirmed that the closing time is indeed about 3 seconds. Regarding the material of the valve, it is not correct to assume 2 mm of stainless steel for a failure simulation: although this is the thickness of the valve in the closed position, while it closes the amount of material is much larger (flanges).