

Machine Protection Working Group

Minutes of the 34th meeting held on June 25th 2004

Present: R. Assmann, P. Baudrenghien, B. Dehning, E. Carlier, R. Filippini, G. Guaglio, E.B. Holzer, C. Ilgner, V. Montabonnet, P. Pugnât, M. Stockner, J. Uythoven, J. Wenninger

Excused: F. Rodriguez Mateos, D. Macina

Topics of this meeting:

- LHC RF frequency monitoring (P. Baudrenghien)
- BLM interlocks follow up (B. Dehning)
- AOB : Oral presentation for EPAC 2004 by R. Schmidt.

LHC RF frequency monitoring (P. Baudrenghien)

For a fixed LHC machine radius, the RF frequency depends slightly on the magnetic bending field (respectively momentum). For protons the RF frequency changes by ≈ 1 kHz between injection and top energy. For lead ions, the RF frequency swing is ≈ 5.5 kHz because the ions are less relativistic than the protons due to their higher mass over charge ratio. **P. Baudrenghien** listed the ingredients required to monitor or interlock the RF frequency at the LHC:

- A counter to measure the RF frequency using the signal provided by the RF group.
- A measurement of the beam energy, such as the Safe Beam Energy that will be provided by AB/BT and distributed by AB/CO (to be confirmed).
- A processor to compare the measured frequency with the expected value that is a function of the energy.

P. Baudrenghien indicated that there are no plans by the RF group to monitor the RF frequency and he proposed that this task should be done by another group. **R. Schmidt** said that the next step is to study a possible realization. The decision on which group should be responsible for such an interlock must be decided at a later stage. In the discussion it was also suggested to survey the RF frequency through the radial position of the closed orbit. Since such a monitoring involves a large number of BPM front-ends distributed around the LHC, the orbit surveillance is better adapted for a software interlock.

BLM interlocks follow up (B. Dehning)

B. Dehning presented the outcome of discussions that took place following the discussions in the previous meeting on interlock signals from the BLMs and on the policy

to bypass interlocks. **B. Dehning** indicated that according to the specifications, only BLMC and BLMS monitors are critical and must be 100% operational. Any faulty BLM channel that is critical prevents injection of beam into the LHC. The arc monitors are not considered critical: a faulty channel can be masked if necessary. For critical monitors, the link between BLMs and interlock system is redundant (i.e. each signal is transmitted to 2 BICs), failsafe and un-maskable. For uncritical monitors, the link is failsafe and may be masked. The mask is applied within the BIC according to the Safe Beam Flag.

During the discussions, **R. Schmidt** explained that the principle of the two signals with different thresholds has been abandoned. An upper threshold value will be defined for each channel, and it will only be possible to *lower* the threshold. For arc monitors a procedure how to mask a faulty channel will have to be defined. **J. Uythoven** pointed out that for the availability studies, one should only use as input the 500-600 critical monitors, and not the entire 3000 monitors.

AOB

R.Schmidt presented a rehearsal of this oral contribution at EPAC04 in Lucerne. The presentation is an overview of machine protection at the LHC. This contribution to EPAC was submitted by **R. Schmidt** and **J. Wenninger** on behalf of the MPWG. The final presentation will be appended to the minutes of this meeting.