Machine Protection Working Group

Minutes of the 35th meeting held on September 3rd 2004

Present: R. Assmann, D. Belorad, F. Bordry, H. Burkhardt, A. Butterworth, E. Carlier, B. Dehning, R. Denz, C. Fischer, B. Goddard, C. Ilgner, V. Kain, D. Macina, V. Montabonnet, P. Nouchi, P. Odier, B. Puccio, P. Pugnat, F. Rodriguez Mateos, M. Stockner, B. Todd, J. Uythoven, J. Wenninger, C. Zamantzas, M. Zerlauth

Topics of this meeting:

- Generation and distribution of Safe LHC Parameters (B. Puccio)
- Review of the machine protection system (R. Schmidt)
- AOB

Generation and distribution of Safe LHC Parameters (B. Puccio)

The list of Safe LHC Parameters (SLP) to be distributed with high reliability to various clients includes presently:

- The safe beam energy derived from the main dipole currents in IR6. The main clients of the safe energy are the beam dumping system, the beam loss system and the injection kicker. Collimator and absorbers are potential clients.
- The safe bean flag derived from a BCT measured in IR4. The primary use of this parameter is the masking of maskable interlock channels. There will be 2 safe beam flags (one per beam).
- The beam presence flag derived from a BCT measured in IR4. This flag is mainly used by the SPS extraction system in combination with the intensity in the SPS. There will be 2 beam presence flags (one per beam).

B. Puccio presented a proposal for the implementation of the SLP distribution. Since a high reliability is required, the standard (technical) network and the timing system cannot be used: a dedicated system must be developed. All parameters should be encoded in a single message: one reliable link is then sufficient for all SLPs. The length of the message to be transferred is ≈20 bits. It is possible to reuse hardware components with adequate speed developed for the timing system (receiver and generator). Both signal generator and user receiver boards should be made available for VME systems. The transmission of the signal will be made over fibre optic link. **B. Puccio** proposes that all systems be connected over a loop, such that the signal can be checked for possible transmission errors at the end of the loop. It is proposed to install the SLP generator in IR4.

Pending questions are:

- How is the energy information transmitted from IR6 to IR4?

- What BCT will be used? (fast BCT, slow BCT ?). How is the BCT information transmitted to the signal generator?
- Over how many bits should the parameters be encoded?
- Are there other parameters that must be distributed?
- Are there other systems that must receive SLPs?

The next step in the design of the system is to discuss (with the involved groups) the transmission of BCT and energy signals. The interface should also be defined sufficiently early.

A number of points were raised in the discussions by the audience. **R. Assmann** insisted that the SBF must also take into account the beam emittance via an appropriate scaling of the energy in the SBF. The aperture kickers, movable BDI screens (BTVs) and wire scanners are among the systems that were identified as additional clients of the SLPs. BTVs are also potential clients of the BPF. **B. Dehning** wondered about the availability of this system, since the hardware is based on the VME standard and since the reliability of VME power supplies is an issue. It seemed however that the system will not add a significant number of critical VME crates to the machine. Both **B. Dehning** and **R. Assmann** are interested in receiving the intensity in addition to the SBF. The question was however raised if this needs to be a safe parameter or if the intensity should not just be transmitted via the timing system. **R. Schmidt** and **J. Wenninger** are worried that with the intensity information, people may start to define their 'own' SBFs! The issue of intensity transmission as SLP must be addressed in a future MPWG meeting. Finally the issue was raised of a change in the SBF during the ramp (from unsafe to safe) due to beam loss. This point must be studied further, but has not immediate consequences on the proposal. When the design will be mature, the proposal will be presented again to the MPWG.

Review of the machine protection system (R. Schmidt)

R. Schmidt started his presentation with the conclusion of the LHC MAC of July 2004: the MAC members had a good impression of the system but were worried about double faults. The later point needs some clarification since so far double faults have been excluded from the analysis. On the other hand, thanks to the many different and complementary interlock channels, a number of double faults are already covered: a more in depth analysis must clearly be performed. The LHC MAC expects more information at its next meeting.

R. Schmidt proposed that, following the collimation review in July 2004, the machine protection system of the LHC be also reviewed before the end of the year. The aim is to obtain feedback before it is too late to perform design modifications… The review will be centred on the strategy for LHC machine protection, on the beam interlock system and on the systems connected to it. The review committee will be asked a number of key questions (see slides). A first proposal of topics / talks to be covered in the review was presented for discussion. The review organizers, the review committee members and the date (possibly 12-15 December 2004) must be defined in the near future.

F. Bordry said that there had been no review on the Powering Interlock System together with the Quench Protection System and Power Converters, and that such review should be considered.

AOB

Following the presentation of the previous meeting on RF frequency interlocking, **R.Schmidt** said that the responsibility for this task must still be discussed.