Machine Protection Working Group

Minutes of the 32nd meeting held on April 23rd 2004

Present: R. Assmann, A. Butterworth, A. Czizsek, B. Dehning, R. Denz, R. Filippini, G. Guaglio, E.B. Holzer, C. Ilgner, D. Macina, D. Perrin, L. Ponce, B. Puccio, P. Pugnat, F. Rodriguez Mateos, J. Uythoven, J. Wenninger, T. Wijnands, C. Zamantzas

Excused: E. Carlier, R. Giachino

Topics of this meeting:

- Location of beam loss monitors (E.B. Holzer)
- Radiation dose monitors at the LHC (T. Wijnands)
- AOB

Location of beam loss monitors (E. B. Holzer)

E.B. Holzer started with a short overview of the LHC BLM system. There are approximately 3850 monitors, the majority being BLMA monitors installed in groups of 6 around each cold machine quadrupole. For monitors installed in the collimation section, the expected range of particle flux extends from 10^4 to 10^{16} mips/cm^{2}s. For the other monitors, the range is 10^2 to 10^{10} mips/cm^{2}s. Data from the BLM system will be logged at around 1 Hz, but the details of the logging implementation are still under discussion. Two post-mortem buffers will be implemented to allow safe testing of the PM system. Each of the 600 cards will deliver around 120 kB of PM data, giving a total PM data volume of around 70 MB.

In the arcs, the BLMs are installed outside of the cryostat in the horizontal plane (at the height of the vacuum chamber) to maximize the signal. The detectors will be distributed longitudinally around the quadrupoles following detailed GEANT shower simulations. **E.B. Holzer** also presented the list and location of BLMs (including the monitor type) for each insertion. To finalize the locations, input from the 'users' is required since the cables have to be ordered very soon.

In the discussion **R. Schmidt** proposed to write a functional specification on the location and type of monitor for the insertions such that concerned person can comment and make suggestions. **R. Assmann** indicated that the BLMs in the collimation regions could be installed near the vacuum pumps. Monitors at the tertiary collimators (TCT) would also be required. The position of the TCT is not yet defined. **D. Macina** noted some differences with the new layout of the Roman pots for TOTEM in IR5, and indicated that ATLAS will submit a request for a Roman pot detector in IR1. The response of the BLMs when the beam touches the Roman pots needs to be worked out with simulation programs (**D.Macina**). **R. Schmidt** said that **V. Kain** proposed to install some detectors around the D2 separation dipole. She also mentioned that monitors close

to the recombination chamber might be useful. It is not clear that monitors at the TAS or BPM Q1 are required, since there are already monitors on the quadrupole magnets close-by.

Radiation dose monitors at the LHC (T. Wijnands)

The main aim of the radiation monitor system presented by **T. Wijnands** is the radiation monitoring of electronics and the confirmation of radiation induced failures. A good knowledge of the radiation map during LHC operation can be used to anticipate degradation of electronics components. It is foreseen to install 125 monitors for the LHC start-up, but the system may be expanded to a maximum of 4096 monitors. The monitors will be concentrated initially around the IRs and in one arc. In the arc the monitors will be installed near the middle of the half-cell, below the dipole, but it is possible to displace them. The monitors will provide the ionization dose, the 1 MeV neutron flux equivalent and the hadron flux. The maximum rate is 10^8 hadrons/cm^{2}s. To provide this data, each monitor involves 3 different detector types. The design of the system is based on experience at the SPS and other irradiation facilities. Eventually data from various sources should be combined to better understand radiation induced damage at the LHC.

In the discussion **R. Schmidt** wondered at what rate the monitors can provide data. **T. Wijnands** answered that the dose will be provided between once per minute to once per hour, while the flux can be given at up to 100 Hz. **R. Schmidt** proposed to write a functional specification to specify the location of elements and give concerned persons a chance to comment on them and submit a request for additional monitors.

AOB

R.Schmidt indicated that a paper on machine protection at the LHC submitted to EPAC by **R. Schmidt** and **J. Wenninger** on behalf of the MPWG had been selected for an oral presentation.

In the context of the LHC injection WG, the possibility to observe a high intensity beam on the TDI screen has been discussed. Such a test is no permitted according to the present injection rules since the high intensity beam must be extracted from the SPS without beam circulating in the LHC (no beam can circulate with the TDI screen at IN-BEAM position). After a short discussion, it was agreed that the MPWG proposes that no special interlock conditions will be foreseen unless the request for such a test is better justified.

Preliminary agenda for next meeting

- Conditions for correct beam dump: Strength of Q4 in IR6 and RF-frequency (J.Uythoven).
- Readout electronics for Beam Loss Monitors (C.Zamantzas).