

# Machine Protection Working Group

*Minutes of the 39<sup>th</sup> meeting held on February 4<sup>th</sup> 2005*

**Present:** R. Bailey, J.C. Billy, E. Carlier, B. Dehning, R. Denz, R. Fillipini, R. Giachino, G. Guaglio, C. Ilgner, D. Macina, V. Montabonnet, B. Puccio, P. Pugnat, F. Rodriguez Mateos, R. Schmidt, J. Uythoven, J. Wenninger

## **Topics of this meeting:**

- Chamonix debriefing (R. Schmidt).
- Modification of the MPWG mandate (extension to the SPS).
- AOB

## **Chamonix debriefing (R. Schmidt)**

The main topic of this 39<sup>th</sup> meeting of the MPWG was devoted a debriefing of the Chamonix@CERN workshop and to **Steve Myers'** main conclusions. **R. Schmidt** presented the list of topics that are related to machine protection and asked for comments on each of the points.

- The first important point concerns initial operation with 43 on 43 bunches which allows reasonably safe operation with luminosities of  $10^{32} \text{ cm}^{-2}\text{s}^{-1}$ . At injection damage is hardly possible, and only few failure lead to damage at top energy.
- A better understanding of the current knowledge on heat deposition by beam loss and quenches is the focus of a workshop to be held 3-4 March at CERN.
- Beta-beating is a serious concern for the LHC, since the tolerances for various systems to not seem to be consisted. **R. Bailey** commented that this topic is likely to be picked up by LHC-OP.
- The interfaces to the experiments are being addressed now. A proposal on how to interlock the spectrometers and solenoids of the experiments has been defined in a recent meeting. The proposal will be presented to the MPWG in the near future. A discussion on interlocks for movable detectors and backgrounds has been started at the LEADE meeting on 31<sup>st</sup> January. The discussions with the experiments will continue and should converge towards a functional specification in the Spring. It is proposed that this activity be coordinated by **D. Macina**.
- Concerning the issue of objects that can touch the beam, the fast valves have been discovered to be a potential problem for protection. Since discussions with persons of the Vacuum group have revealed that the fast valves may not be as useful to the machine as was thought initially, **R. Schmidt** will reject the specification document. He will propose alternatives.  
Concerning beam instruments, **J. Wenninger** has started discussions on the screens of the SPS-LHC transfer lines. He will extend the discussion to LHC instruments (screens, wire scanners, alignment mirrors) in February.

- **M. Werner** (DESY) who is responsible for the development of a fast magnet current decay monitor at HERA will visit CERN for 3-4 weeks in March-April. A hardware test of such a device will be organized at CERN to evaluate its potential for the LHC. It will then be necessary to find a group responsible for the developments for the SPS and the LHC.
- The presentation by **J. Uythoven** on the availability and reliability of the protection system triggered reactions by **S. Myers** due to the present estimate of 5% false dumps due to the machine protection system. **R. Bailey** commented that at LEP at least 50% of the fills were lost due to faults of some kind, so the machine protection system would only represent 10% of those cases if the situation is similar at the LHC. Concerning the SIL level that is between SIL2 and SIL3, **B. Dehning** commented that this is 'dominated' by the BLM system and could be improved. **R. Schmidt** proposed to organize a MPWG meeting dedicated to the reliability studies in the near future.
- On the front of interlock system commissioning it was proposed to continue work with the hardware commissioning and the SPS transfer lines. Procedures for interlock testing must be established for the hardware commissioning all equipment systems. For the SPS transfer lines it is possible to base the future work on the experience with last year's TI8 tests.
- In order to understand better if there are any holes in the protection system, it would be useful to perform tracking with a complete machine model, including apertures and errors.
- Following the successful material test at 450 GeV, the next step is to understand the damage at 7 TeV. Failure scenarios are required to understand the impacts (in particular angles) for the simulations, although the work could start for some simple scenarios with impact at 90 degrees. **D. Macina** commented that a fellow in TS/LEA has made simulations for TOTEM indicating that a single nominal bunch at 7 TeV would damage the bottom of the TOTEM roman pot.
- Finally the question of the worst case scenarios where the beam dump does not work should be addressed again. Here there are clearly two situations. The first concerns the case where the beam dump does not fire in the case of a dump request issued by an operator (end of fill...). Procedures must be given to the OP crews on how to proceed in such a case (beam scraping and other emergency measures). If on the other hand the beam dump request is coming from the machine protection system due to an emergency, nothing can be done. But an estimate on how much damage is caused to the machine should be available.

As a very last item, **R. Schmidt** proposed to organize one of the coming MPWG meetings during the afternoon to be followed by a drink.

### **Modification of the MPWG mandate (J. Wenninger and R. Schmidt)**

Machine protection of the SPS is closely linked to the LHC over the extraction/injection. The transfer lines are handled by the SPS operation group and the SPS control system, by they are critical for the LHC. Furthermore the interlock system

hardware is identical between the two machines and the people that are involved are almost all members of the MPWG and/or InjWG. For those reasons **J. Wenninger** and **R. Schmidt** propose to integrate machine protection of the SPS into the mandate of the MPWG. **R. Schmidt** proposed to co-chair the MPWG together with **J. Wenninger**, in general the meetings concerning the SPS + transfer lines would chaired by **Joerg**, and the meetings on LHC by **Ruediger**.

Since nobody opposed to this proposal, the change of mandate will be proposed to the LTC for approval. The mandate of the MPWG will be adapted in consequence. **R. Bailey** commented that it may be necessary to report to another AB committee concerning the SPS interlocks.

## **AOB**

**R. Schmidt** came back to the organization of the review of the machine protection system on 11-14 April 2005 (final date). The outside reviewers from FNAL, BNL, SLAC, SNS, DESY and PSI have been identified and most of them have already confirmed their participation. A possible candidate from the nuclear, laser or space industry/community may still be added. Preparation meetings should be held soon to identify speakers and finalize the program. Since the powering interlock system is not part of the review, it was proposed to organize a one day CERN internal review on that issue this year (**F. Rodrigues-Mateos** will come up with a proposal).