126th Meeting of the Machine Protection Panel

Participants: A. Alici, W. Bartmann, J. Boyd, E. Bravin, A. Di Mauro, A. Goriseil, E.B. Holzer, M. Kalliokoski, F. Kassel, D. Lazic, M. Rijssenbeek, R. Schmidt, C. Schwick, M. Trzebinski, M. Valette, J. Wenninger.

The slides of all presentations can be found on the website of the Machine Protection Panel:
http://lhc-mpwg.web.cern.ch/lhc-mpwg/

1.1 Approval of MPP#125's minutes

- Actions from 125th MPP:
- Jorg: There are inconsistencies with the TDE pressure interlock on injection, because there is already a beam interlock with a limit between 1.1-1.3 mbar. AN injection interlock does not add anything more...
- No additional comments were received on the minutes; therefore, they are considered approved.

1.2 Thresholds for BSRA (abort gap population) and automated beam dump by SIS (W. Bartmann)

- This discussion was started in Chamonix. Reasons for the dump flag still being masked.
- Reminder cleaning 2015:
  - Continuous cleaning at injection.
  - No cleaning during ramp.
  - At 6.5TeV: Automatic cleaning above 3.5e9 charges, dump at 4e10 charges.
  - Thresholds depend on beam energy.
- Slight effect on luminosity at flat top.
  - Jorg: when it is turned on, the tune feedback is also affected which is a problem during the squeeze
- Procedure for AGC:
  - EDMS doc describing changes from Run1 to Run2.
  - FLUKA simulations, damage and quench limits on Q4 & Q5.
  - Take 10% off the lowest limit.
  - Taking into account the risk of dumping because of losses in IP3 if the cleaning starts too high.
  - Even when dumping with a filled abort gap we should not damage the machine.
- Signal from AG monitor is now very clean and reproducible.
- AG cleaning can be precisely adjusted (+/-100ns).
- Possible updates:

  - Taking into account for the cleaning only the critical parts of the AG (i.e. splitting it in different slices) is possible but would complicate procedure.
  - Only the beam in the first 500ns ends up on the collimators or on the dump channel protection devices in IR6.
  - Discussion on WAIT area (above 1e12 p+ in AG, >10 nominals, cleaning failed, SIS didn't dump) -> operator has to take a decision, dump most probably, but some system must be experiencing some serious problems.
    - Jorg: in such a case, in under a minute you will dump because of losses in IP3.
    - Rudiger: it's difficult to let the operator take a decision.
    - Jorg: we should have a simple instruction as there is no time for improvisation.
    - Wolfgang: we should dump then, there should be no risk at all to just dump, anyways we should dump before and this case should not happen.
- Cleaning and dump flag in 2016:
  - Cleaning events and Dump events mostly correspond to asynchronous beam dump tests.
  - So far none recorded in Stable Beam. --> only mid of intensity ramp-up.
- Last year:
  - Cleaning triggered once a month.
  - Dump was never up.
- Proposition: Keep the dump flag masked and monitor over longer Stable Beam period
  - C. Schwick: it should just never happen.
  - Jorg: this year the AG is so clean we don't even need cleaning. We could just activate it for 1 minute when arriving at Flat Top.
  - C. Schwick: what is the population limit at injection?
  - Wolfgang: AG filled with bunched beam
- Conclusion: the present procedure is appropriate for the 2016 run, just monitor the dump flag.
  - Jorg: we should also remove WAIT, investigation will not lead anywhere, we should just dump in this case.

1.3 BCM/BLM thresholds of LHC experiments vs LHC BLMs (M. Kalliokoski)

- This work was already presented in BLMTWG.
- In April, the beam was dumped because of ATLAS BLM/BCM.
- Reminder on BCM: signal is measured in .39ns bins grouped in buckets of 25ns. The first half is out-of-time and the second In-time signal.
- If 3 or 4 out-of-time signals are paired with in-time the Beam permit goes off.
- Reminder on dBLMs: if 2 out of 6 channels are over threshold (350 hits in 40us) Beam permit is lost.

- Example: during the D1 powering failure (MP test) on April the 14th, BCM dumped.
- BCLM Running sums I-IV (40us to 640us) thresholds are based on tracker community damage thresholds, with a margin factor of 1000 to avoid damage on pCDV
    - Jorg: the margins are really high, e.g. the LHC couldn't run with such margins.
- During splash events on March 29th, the splashes hit the collimators upstream of CMS. The high intensity splashes triggered the beam abort by one of the BCLMs.
- Conclusion: ATLAS might be the most sensitive, showers from the TCLs might be dominating TCTs.
    - Kallikoski: we need more data and experience to understand what we see in these detectors.
    - Rudiger: what about UFO events?
    - Goriseil: with the timing system we can see which side it is coming from.
    - Rudiger: would be interesting for a MD to calibrate this.
    - Boyd: in 2016 we didn't have any UFO large enough to see anything.
    - E.B. Holzer: because beta* is small (and divergence is high) we couldn't detect a UFO inside the detector.

AOB – Re-validation of CMS solenoid input following temporary masking (C. Martin)

- After YETS the recommissioning happened in 3rd week of April during beam commissioning.
- In case of a Fast Power Abort, the beam is dumped.
- This flag was masked during test phase.
- As the CMS solenoid is again operational all interlocks have been put back online.
- In August 2012 the CMS solenoid tripped, 3 minutes and 7% of B2 lost later the BLMs dumped. The solenoid current was 40% of nominal at the time of the dump.
- Following this the FPA was connected to the BIS and the Beam is now dumped right away, before any effect on the beam is expected.
- The interlock is now validated and online.
    - Jorg: the orbit feedback is now active during stable beams and would compensate the orbit change. Such a dump would not occur anymore.
    - C. Martin: there is a few seconds delay between beam permit A and B, this could cause an error in the BIS IPOC.

AOB – General

- The retraction of Roman Pots is not coupled to the retraction of the TCL6s since those are completely independent devices.
    - TOTEM doesn't mind TCL being inserted, whereas AFP would like the TCL6s to be retracted when they are out due to the radiation that the

TCL6s induce on ALFA. Some TCLs (we have TCL4, TCL5 and TCL6) must be in place at high luminosity to lower the radiation to electronics and showers induced by collision debris.

- A future MPP meeting is planned end of May, after IPAC.
- To be discussed: High beta* runs in September with ~2.5km beta* and parallel beams, 1mm sigma in the IP and very low phase advances, shouldn't be a problem for cleaning but the TCTs are vulnerable.
    - Jorg: Probably worth doing a round of analysis, Roderik Bruce could be a good candidate to analyse this case.

Action: Discuss the protection and hierarchy (incl. phase advance between MKD and TCTs) for 2.5km optics (MPP, Coll, OP).