MPP meeting 15 October 2008

Preliminary agenda:

* Injection and circulating beam failure simulations (R. Appleby)
* Summary of collimator interlock tests (S. Redaelli)
* Round table discussion on shutdown plans for the various MP system.

Present:

Mike Koratzinos, Stefano Redaelli, Massimiliano Ferro-Luzzi, Verena Kain, Alvaro Marqueta, Jeremy Fleuret, Bruno Puccio, Etienne Carlier, Laurette Ponce, Bernd Dehning, Gianluigi Arduini, Daniela Macina, Jorg Wenninger, Rudiger Schmidt, Robert Appleby

Minutes:

News/organization

Joerg: Web site of the group: re-used the old site, there is now a symbolic link from old site to the new one

Bernd: Decision-making process should continue, actions to be taken should be defined. Ruediger: caution: reorganization of the sector plus the 19 September incident might slow things a bit but this group is working well irrespective of divisional structure.

All: Prepare a proposal to be ready by Chamonix 09.

Beam accident scenarios (Rob)

Rob presented his analysis of various beam accident scenarios concentrating on implications for the experiments (see presentation). He has looked into aperture restrictions – as apertures are very small, particularly with movable detectors like LHCb VeLo and TOTEM, and PC failures, quenches, operational failures (local bumps), and 'freak' cases.

- Injection: wrongly set magnet – orbit distortion on turn 1
    - Points 1 and 5 done before: protons hit the TAS (is the alignment correct?) cannot be moved easily. Should be reviewed
    - LHCb and Alice: no TAS. Rob considered 4 scenarios (MCBXH, MCBXV, D1, D2). Ruediger: what if non- standard injection? Jorg: not a lot of room for error, if collimators in place
    - From his analysis Rob has derived a table with 'safe' thresholds. For example, thresholds for separation dipoles are ±6% of the nominal 7 TeV current.

- o Software interlocks are now 100urad for corrector dipoles, safe according to above study. Software interlocks for separation dipoles is 3% of the nominal 450 GeV current (again safe), can go down to 1% once the settings at injection are well established
  - o Compensation dipole: interlock is needed. Joerg: the interlock will handle compensator and dipole together to ensure that the bump is always closed. This also ensures that any setting of the bump can be handled without need of multiple references.
  - o Rob: We need independent interlocks to avoid very big closed bumps. Need to interlock both magnitude as well as ratio
- Circulating beams
  - o Errors considered:
    - ▪ PC error: current goes to zero or to max current with a circuit-dependent time constant
    - ▪ Quench: current decay with time constant of 200msec at 7TeV
  - o Next step: Include the real decay curve from HCC data. For the inner triplet Mike will provide data. (No data exists for arc magnets.)
  - o Ruediger: reminded us that there is a QPS integration time of 10msec. For some circuits there is the possibility to make this time shorter (but not for the arc magnets) Jorg warned against too short an interval (due to the increased possibility for false quench signals)
  - o TOTEM: (optics used is LHC 6.5 optics, not TOTEM optics)
    - ▪ Stefano is surprised that a secondary collimator is hit first (TCLA is made of tungsten, fragile). After the meeting indeed Rob found an error in his settings of the TCLA collimators and indeed TCPs are hit first.
    - ▪ In all cases considered TOTEM shielded by collimators. (No rescattering simulations performed.)
  - o VELO: not inserted at 450Gev, therefore no danger from cases considered
- Local bumps
  - o Totem 220m pots (10sigma): Can create horizontal bump to hit the pots. In the vertical plane pots are safe.
  - o Bump is slow. There should be a software interlock after steady conditions are reached.
  - o Can downstream BLMs be used to alert operator/dump beam?
  - o What about a combination of unnoticed local bump and a quench/failure?
  - o Rudiger: dirty abort gap might create problems while dumping
- Conclusions
  - o Injected beam software interlocks are sufficient to protect ALICE and LHCb from settings error at injection.
  - o Report in preparation
- Discussion
  - o There was a discussion on how to keep the machine and experiments safe from local bumps and other failures:
    - ▪ Set limits on the automatic feedback system

- Alarms or automatic dump? Panic Button to remove TOTEM to avoid losing the store? Experience needed
- Operational experience: 30um per degree drift due to electronics warming up– 5um over an hour after correction
- BLMs not useful in one turn failures but slow failures should be picked up by BLMs. BLMs could trigger in 1ms
- We need software limits (sanity check). Jorg: eventually we also need current limits on most critical quads.
- For local bumps we need a window around latest orbit
- TOTEM is very close to the beam at 1mm. Gather experience while TOTEM is out first.
- Some work (and real data) is needed to finalize strategy for the above

Points arising from the presentation:

- TAS: cannot be moved easily. Is alignment verified? Should be reviewed.
- Is QPS integration time of 10msec acceptable?
- Dirty abort gap issues to be discussed
- Puzzle of hitting TCLAs before main collimators resolved after the meeting. Primary collimators are hit first.

Collimator commissioning (Stefano)
- Paper on collimation system commissioning exists, outlining operational procedures which were followed
- Settings and limits are: operational tolerance and dump threshold
- Checked that hardware does not go above limits – tedious work but all results stored and will be put in MTF. Will also be available on a web page.
- All collimators tested, no major issues, a handful of problems being followed up.
- Need to define subset and run collimator commissioning on cold checkout
- Special cases:
  - TCDQ positioning interlock due to different hardware and software. Dedicate part of a future meeting to discuss TCDQ
  - TDI positioning interlock: tests failed due to wrong connection to BIC. Will conclude tests.
- Temperature interlocks: there are no heaters, so difficult to test. 4 problems found. Special elements (TCDQ, TDI): no interlocks implemented. If needed can be implemented.
- Roman Pot interlocking: it is a different group looking after them, but should provide same functionality
- Reproducibility tests: after 20 ramps to 7TeV, one collimator at 90um reproducibility, all others better than 20um.
- Should we re-run all tests next year? Software will clearly change… Ruediger: we need an automated procedure (Joerg reminded us that BIC is logged but not decoded yet)

- All: clear recommendation that all tests should be automated

Next meeting
In three weeks. Topics: dump failure; abort gap cleaning.