

148th Meeting of the Machine Protection Panel

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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#147's minutes

- Actions from the 147th MPP:
 - None.
- No additional comments were received on the minutes; they are therefore considered approved.

1.2 AFP - XRP commissioning results and status (S. Jakobsen)

- The performed ATLAS-AFP interlock validation included the validation of injection permit, tests of the response to the LVDT-to-limit comparison, test of USER_PERMIT and the automatic extraction as a function of all input flags, test of the LVDT-bypass box, as well as tests of hardware and software buttons.
- For injection permit, the test purpose was to check that the injection permit is removed if a Roman Pot (RP) is out of garage position. The test sequence is shown in slide 3 and was performed separately for each RP on 15.05.2017 (details can be found in collimation logbook). Everything worked correctly.
- For LVDT-to-limit comparison, the test purpose was a check of the automatic extraction and loss of USER_PERMITS when a position limit is violated. As the motor control doesn't allow to move a RP to an illegal position, the position limits were changed after movement of the RP, to make the current position illegal. The correct change of the USER_PERMIT signal was observed. Such test was performed separately for each RP on 15.05.2017 (details can be found in collimation logbook), and everything worked correctly. "Ringing" for the USER_PERMIT was observed for several RPs, which is not a problem of safety.
- The response on the change of beam mode flags and the override key was tested. The beam modes were changed without and with the override key in place from STABLE_BEAM to UNSTABLE_BEAM and ADJUST. The automatic retraction of the RPs and the change of the USER_PERMIT were observed. Such test was performed for one RP per beam on 15.05.2017 (details can be found in collimation logbook), and everything worked correctly. "Ringing" for the USER_PERMIT was observed for several RPs.

- The LVDT-bypass box was tested to check that if it forces the LVDT comparison TRUE while simultaneously disabling the motors. Several fake situations were considered (full definitions can be found in EDMS note 1808750 in preparation). In addition, the correct functioning of the software and hardware buttons was tested. The tests of the LVDT-bypass box and buttons were performed for one RP per beam on 15.05.2017 (details can be found in collimation logbook), and everything worked correctly.
- In conclusion, all the tests originally performed for TOTEM and ALFA have now also been performed for the final AFP movement and interlock systems. Everything is working correctly. Some “ringing” has been observed on the USER_PERMITS, but it has no influence on safety aspects. The EDMS note 1808750 entitled “The ATLAS-AFP interlock logic in 2017: specification and test results” is in preparation.
- At last, Sune added a reminder for the AFP RP settings during 2017 physics production. As previously agreed, the general RP setting is $TCT + 3 \sigma_{\text{nominal}} + 0.3 \text{ mm} = 12 \sigma_{\text{nominal}} + 0.3 \text{ mm}$. For startup phase, it becomes $TCT + 3 \sigma_{\text{nominal}} + 0.3 \text{ mm} + 0.5 \text{ mm} = 12 \sigma_{\text{nominal}} + 0.8 \text{ mm}$. It is important to make the change to the ultimate settings no later than in TS2, since AFP suggests to move to the ultimate settings in the middle of the summer.
- Sune proposed to set the warning limit 0.2 mm and the dump limit 0.3 mm from the defined position.
 - Stefano commented that he did not see the necessity of such high margins, and suggested to reduce the two values by 0.1 mm each.
 - Mario reminded that it has been observed in some cases that the LVDT measured positions were slowly oscillating over hours and days. The observed maximum peak-to-peak offset has been 0.12 mm.
 - Daniel pointed out that in case of long term drifts, a re-alignment of the RP might be necessary.
 - Finally an agreement was reached, i.e. adopting a tentative margin of 0.15 mm (might be tightened later) between the Warning Limit and the defined RP position and a margin of 0.2 mm to the Dump Limits.

1.3 Review of MPS readiness for unsafe beam / trains (D. Wollmann)

- MPS re-commissioning status can be found here [“MPS re-commissioning 2017”](#) (which is daily updated).
- Outstanding tests for Injection / LBDS (based on input by Wolfgang, and after comments during the meeting):
 - Validation of Interlock BPMs: before 3b stable beams; ABT and BI, ~4h.
 - BLM inhibit: No need before unsafe beams; Christos and ABT, few hours pilot, few train injections (probably possible parasitically).
 - TCLIB.P8 hierarchy check: Before 12b; X-measurement; ABT; Requires loss maps afterwards.
 - Validate 12b injection; ABT.
 - BETS TDI check: No beam; Before 12b; ABT.

- BETS TCDQ: Ramp with pilot; Before 3b in stable beams; Loss maps required.
- AG cleaning: Before trains are ramped; AG monitoring required.
- Injection gap cleaning: No MP relevance.
- Verify Direct BLM triggering.
 - Jan pointed out that during the recent test only one of the direct BLMs triggered. In the other case the ring BLMs were faster to trigger the beam dump. The correct functioning of all the direct BLMs has to be verified.
 - Christos replied that the trigger of the second direct BLM was observed (although the ring BLMs triggered the BIS and beam dump earlier). The direct BLMs are therefore fully verified.
- BI / BLM (reviewed by Christos in the meeting):
 - Interlock Inhibit at injection has not been tested yet - not blocking.
- Collimation (reviewed by Stefano in the meeting):
 - TCLIB issue with hierarchy - solved.
 - RP alignment and preparation of settings / sequences.
 - Energy and betastar limits were deployed. The various cycles done so far are being checked off line.
 - DOROS BPM - SIS Interlock: to be discussed with Jörg. From collimation side, the planned beam tests at injection and top energy have been completed.
 - Loss map table is proceeding, but is to be completed. The summarized status can be found in the presentation.
 - Some strange loss pattern in IR7 appeared during the preliminary off momentum loss maps done recently. If possible, the alignment of a few collimators at flat top will be checked.
 - Alignment issues with TCL4L5.B2: A tilt angle was observed, which needs to be investigated further. Inspection in the tunnel performed recently did not reveal any issue, but a detailed survey was not possible. We may operate like that until TS1, so this is not blocking at this stage.
 - In addition to the loss maps, the collimation team requested, as in 2016, an asynchronous beam dump with tighter TCT settings to validate the phase advance (MKD-TCT) assumptions.
 - Collimators with wires: still missing machine protection tests on fifth axis.
- SIS / OP / Feedbacks (reviewed by Jörg in the meeting):
 - SIS orbit interlocks to be re-calibrated / verified.
 - Validate DOROS SIS channel.
 - Orbit feedback issue & feed forward.
 - PC interlock - tighten thresholds (has been started) and unmask before intensity ramp-up.
- BIS / PIC / WIC / FMCM / SMP (reviewed by Jan in the meeting):
 - Finalize FMCM tests (top energy).
 - Verify SMP flags, when ready for trains (unsafe beam).

- PIC: 60 A powering permit - not blocking, but to be understood in the coming weeks for implementation of SIS interlock.

1.4 AOB: Update of intensity increase checklist & Update of MPP membership - proposal (D. Wollmann)

- For intensity ramp-up checklist, responsible persons for machine protection relevant systems were listed.
- The 2017 templates for the intensity ramp-up checklists and the link to the rMPP EDMS node are provided below:
 - [LHCIntensityIncreaseRun2V2](#)
 - [LHCIntensityIncreaseScrubbingRun2V2](#)
 - [Link to rMPP EDMS](#)
- The list of MPP members has been updated and can be found [on the MPP website](#). Feedback from the experiments, BI / BLM, Collimation and EN / STI is still outstanding.

AOB - all

It is planned to have a joint Collimation & MPP meeting on Monday 29.05.2017 and the next regular MPP meeting on Friday 02.06.2017.