244th Machine Protection Panel Meeting (LHC)

Friday 08 March 2024

Indico

Participants

F. Alessio (EP-LBC), C. Bernius (EP-UAT), C. Boucly (SY-ABT), C. Bracco (SY-ABT), A. Butterworth (SY-RF), A. Calia (BE-OP), V. Coco (EP-LBD), M. Deile (EP-CMT), Y. Dutheil (SY-ABT), M. Gasior (SY-BI), A. Gorisek (EP-ADO), D. Jacquet (BE-OP), A. Lechner (SY-STI), B. Lindstrom (BE-ABP), N. Magnin (SY-ABT), M. Milovanovic (EP-UAT), D. Mirarchi (BE-OP), G. Pigny (TE-VSC), M. Pojer (TE-MPE), A. Radeva Poncet (BE-CSS), S. Redaelli (BE-ABP), A. Rummler (EP-ADO), M. Saccani (SY-BI), B. Salvachua Ferrando (SY-BI), B. Schofield (BE-ICS), R. Secondo (TE-MPE), M. Solfaroli Camillocci (BE-OP), M. Trzebinski (EP-UAT), J. Uythoven (TE-MPE), F. Van Der Veken (BE-ABP), J. Wenninger (BE-OP), C. Wiesner (TE-MPE), D. Wollmann (TE-MPE), C. Young (EP-ADP), C. Zamantzas (SY-BI)

Minutes from previous LHC MPP meetings (D. Wollmann)

Daniel asked if there was news on the action from the 243rd MPP regarding the opening of TCL4/5. Frederik confirmed they are working on it and the study will take several weeks. As an initial estimation the position of TCL 4/5 should be the same in mm as last year.

The minutes are still in preparation and will be distributed in due time..

LBDS test mode: implementation and validation (Nicolas)

Nicolas explained that the modifications required for the remote test mode of the LBDS have been implemented and successfully tested . The remote reliability test of the LBDS system has been performed.

The team implemented the comments on the CCR proposal (https://edms.cern.ch/document/3014858/) and a new version has been distributed for approval.

Presently, the system is switched in remote mode.

Update to the LBDS MPS commissioning procedure and checklist (Yann)

Yann commented that the 3 tests for the remote LBDS test mode have been added to the MPS LBDS recommissioning document and checklist. The new version of the LBDS

commissioning procedure has been sent for approval (https://edms.cern.ch/document/896392/).

Update to the BCCM commissioning procedure and checklist (Marek)

Marek gave a brief recap of how the BCCM protection system works and explained the implementation of the comments in the BCCM commissioning procedure and checklist. Notably, the commissioning tests have been updated with the new interlock limit table. The new limits are aligned with the BLM thresholds and are designed to trigger a beam dump right after the BLM system.

The new interlock limits, commissioning procedures and tests are summarized in the updated ECR in EDMS (https://edms.cern.ch/document/2683896/).

Following a question related to changing the thresholds with beam in the machine asked by Belen, Marek explained that the thresholds of the BCCM system can only be lowered (ensuring tighter protection). The system resets the limits after each dump.

Marek also commented that the tests with energy above 0.5TeV and 600b (with longest operational batches) are designed to ensure that the intensity is never underestimated and the measured intensity is within a 10% of the FBCT.

Matteo asked for clarification on how many dumps at flat top are required for this test. Marek reassured that only 1 dump is necessary as they can check the behavior of each of the four systems independently (B1A, B1B, B2A, B2B).

Daniel asked about the status of the BCCM system integration with the BIS. Marek answered that the BCCM is not yet enabled. BI will trigger the necessary actions with the BIS team after they deploy the latest firmware (**Action, Marek, BIS team**).

The BCCM checks presented will need to be integrated in the checklist and checks need to be executed.

Belen asked if the BCCM BIS input is maskable for commissioning activities (e.g. loss maps). Marek confirmed that the BCCM is a maskable BIS input.

Readiness for first beam - BLM (Mathieu)

Mathieu presented the status of the BLM system. He recalled the changes made during the YETS to the monitors (5 new ICs and 10 SEMs replaced by LICs in 6L7), hardware (preventive maintenance), firmware (minor changes) and software (LSA and Layout DB updates, migration to EDGE3 drivers, updated FESA classes to support PM on-demand and 100Hz diagnostic).

Mathieu reported that all the MPS commissioning tests have been performed successfully.

Mathieu explained that ABT and BI prepared a new commissioning procedure for the BLM blinding to be tested with beam.

Daniel asked if the improvements during the YETS also fix the water cooling issue in P3 that was experienced last year. Mathieu answered that they are in contact with CV to follow up on the issue. On the BI side, the water cooling is at the maximum capacity but the

temperature of the intake water is not optimal at the source. Major improvements can be made only during LS3.

Christoph recalled that last year the BLM system sent wrong or inconsistent PM buffers on one occasion, visible in XPOC. He then asked if the issue was fixed. Christos answered that they have identified the problem (multiple triggers) and implemented a possible solution. However, the problem could not be reproduced in the lab, which makes a final validation difficult.

Readiness for first beam - ALFA/AFP (Maciej)

Maciej reported that ALFA has been decommissioned and disconnected from the BIS. AFP interlock tests have been performed .

Christoph asked about the status of the temperature probes of ALFA. Maciej answered that they were disconnected also from the pots that still remain in the machine. Cooling is performed via a fan system, which remains always active (with redundancy). Daniel asked if the fan system status could be remotely monitored. Maciej answered that they don't have monitoring on the fans and they can only be checked with a visual inspection during a TS. This will be performed.

Readiness for first beam - BIC, PIC, WIC, FMCM, SMP (Raffaello)

Raffaello reported that MI systems (WIC, PIC, FMCM, SMP and BIS) are tested.

RQ4 L1 and R1 circuits have been removed from the PIC.

Pending actions are the analysis of the AUG tests, the test with beam on RD1 and TI2 and TI8 TED movement tests (offline).

Readiness for first beam - Injection & LBDS (Yann)

Yann reported that the injection and LBDS tests are done.

The BTVDD issue has been fixed by software experts.

Readiness for first beam - Collimation (D.Mirarchi)

Daniele reported that all the MP checks have been performed and validated.

Regarding the crystals, only the replacement chamber interlocks have been tested as the crystals will not be used with high intensity protons.

Readiness for first beam - Vacuum System (G.Pigny)

Gregory reported that the checklist has been completed and tests were successfully performed.

During the YETS new ion pump controllers have been installed in P1/2/5/8. The penning gauge signals for the MKIs have been temporarily being replaced by the ion pump signals.

LHCb VELO safety system was commissioned in December and the SMOG2 injection has been correctly tested.

Issues with LSS1 interlock cables and LSS8 valve mechanical have been solved. The issue with the Penning gauges for the MKI link operating under range is being followed up together with ABT. Jan asked if the new vacuum signals coming from the ions pumps for the MKIs are used for interlocking. Jorg answered that they are in SIS. The new signals will have a lower resolution than the old ones.

Readiness for first beam - TOTEM/CT-PPS

Mario reported that TOTEM tests are completed.

He also reported a new LVDT calibration has been performed to compensate for the drifts observed last year.

Readiness for first beam - SIS (J.Wenninger)

Jorg reported that all the SIS tests have been performed.

Readiness for first beam - RF & ADT (A.Butterworth)

Andy reported that the commissioning has been completed for the RF cavities and beam control.

He reported that an access (and emptying of the modules) is needed to change the power coupler for module 6B1. Nevertheless, the situation is ok for pilot beams.

ADT should also be ok as nothing changed with respect to last year.

Intensity ramp-up proposal (C.Wiesner)

Christoph recalled the past intensity ramp ups and presented the proposal for 2024.

The intensity ramp-up includes steps at 3/12 - 75 - 400 - 800 - 1200 - 1800 - 2400 – full machine.

For each step at least 15h in stable beams and at least 2 fills (reaching the end of B* levelling) are required.

Machine protection systems checklists will be completed by the experts before advancing to the next intensity step. The check tasks are under review, including new tasks concerning the VELO, BCCM, and bunch length evolution. All system responsibles are asked to contact Christoph in case of proposed changes of check tasks and/or a change of responsibility.

The bunch intensity for 2024 will be limited to 1.6e11 ppb.

Jan recalled that in total 24h of MDs can be inserted during the intensity ramp up while experts are verifying machine protection systems for the checklist.

Daniel thanked all the system experts and acknowledged that from a Machine Protection perspective the LHC is ready for the first beam of 2024.

The MPP endorsed the intensity ramp-up proposal.

Actions

- BI will trigger the necessary actions with the BIS team after they deploy the latest firmware (**Action, Marek, BIS team**).