207th Machine Protection Panel Meeting (LHC)

Friday 30 April 2021 (Zoom)
Indico MPP Website

Participants

T. Argyropoulos (BE-OP), A. Calia (BE-OP), M. Deile (EP-CMT), M. Di Castro (BE-CEM), Y. Dutheil (SY-ABT), C. Hernalsteens (TE-MPE), H. Hillemanns (EP-AID), M. Hostettler (BE-OP), D. Jacquet (BE-OP), D. Lazic (EP-UCM), A. Lechner (SY-STI), E. Matheson (BE-CEM), D. Mirarchi (BE-OP), F. Moortgat (EP-CMG), D. Nisbet (SY-EPC), B. Petersen (EP-ADT), F. Roncarolo (SY-BI), M. Saccani (SY-BI), B. Salvachua Ferrando (SY-BI), B. Schofield (BE-ICS), R. Secondo (TE-MPE), M. Solfaroli Camillocci (BE-OP), G. Trad (BE-OP), J. Uythoven (TE-MPE), F. Van Der Veken (BE-ABP), M. Villen Basco (TE-MPE), J. Wenninger (BE-OP), C. Wiesner (TE-MPE), D. Wollmann (TE-MPE), C. Zamantzas (SY-BI).

MPS re-commissioning in the MPP: Overview (D. Wollmann)

D. Wollmann recalled the goals of discussing the MPS re-commissioning needs in the MPP and presented the updated list of presentation dates and documents in EDMS with the machine protection procedures for LHC re-commissioning.

Re-commissioning of the Software Interlock System (J. Wenninger)

J. Wenninger presented the status of the LHC SIS. No fundamental changes have been implemented with respect to Run2 apart from the adaptation to BE-CSS LS2 baseline software stack and Java 11 migration.

During LS2, it was considered to move some signal processing logic to UCAP but the cost/benefit ratio was not sufficient to justify a migration at this point.
The EDMS document 1062498 will be updated and tests will be put in the checklist tool. All interlocks will be tested before the pilot beam test.

The powering access logic for personnel protection during powering test phase 2 has been operational since January 2021. Of special note, redundant energy extraction switches opening from SIS correctly triggered since the beginning of the year but signal arrival at the level of the CIRCUIT SCADA is to be checked (Action J. Wenninger and A. Antoine).

The Beta* reconstruction in SIS is implemented and its integration with SMP will be soon tested in simulation mode in order to validate the integration between the two systems.

Transfer line optics ID generation by SIS has been implemented and the value is published to SMP to allow interlocking on the TCDIS gaps. Correct implementation of the interlock on the TCDIS has to be verified (Action Y. Dutheil). The optics ID is published by SIS if an optics can be reconstructed from the power converters references in LSA and the SPS Fast Extraction Interlock references, otherwise an invalid optics with 0 as ID is published. This approach can be used in the future to add an extra interlock at LHC injection to verify that the optics ID is considered valid by SIS (value different than 0) (Action J. Wenninger).

SIS has been updated to follow the change in the LHC PC Interlock server:
- Orbit correctors interlocks split by beam and plane
- Quadrupole interlocks split by beam
- Dipole (RB) and separation dipole (RD) interlocks added

Following the introduction of TDIS A,B,C in TI2 and TI8, SIS has been adapted to interlock upstream and downstream gaps of all of them. Additionally for injection permits in B1 and B2, a check on the SPS dynamic destination is performed.

TDE N2 pressure interlocks gauges need to be added to SIS following LS2 hardware updates (Action J. Wenninger).

Discussion

R. Secondo reassured that there are no API incompatible changes on the SIS and SMP connection. This was confirmed a week after the meeting during the SMP test in the CCC.

J. Uythoven asked for clarification about the opening of the energy extraction interlocks by SIS during the powering tests. J. Wenninger mentioned that this is an extra layer of security that will open the switches. Since SIS is slower than the hardware link for opening the switches, it is expected that the switches are already open at the moment of the SIS signal. Therefore it is important to check that the CIRCUIT SCADA system correctly receives it in the logs, since in a normal scenario SIS has no visible effect. D. Wollmann pointed out that this needs to already work reliably, as we are doing a lot of training quenches in the main dipole circuits.

Y. Dutheil triggered an initial discussion about the optics ID for Beta* interlock in the transfer lines. It will be followed offline how to reconstruct the optics from the currents in the transfer line quadrupoles.

BLM System: Summary of the major installation changes & TIM development (B. Salvachua)

B. Salvachua presented the summary of the changes to the BLM system during LS2 and the plans for the irradiation test with TIM.

Due to the opening of the dipole interconnections in the context of the DISMAC project, the BLMs on the top and left-side of the interconnect had to be removed and BLM and QPS

cables had to be lifted. All but 1 BLM have been put back in place. The last one (QEBI.11L4) will be put back in June/July after realignment and tomography of the sector.

Additionally, each BLM label now has an associated QR code for machine-friendly accessibility.

The major BLM layout and position changes were presented and will be summarized in an Engineering Change Request that will be released soon.

BLM system tests are summarized in the EDMS document [896394](#), which will be updated with minor modifications. Of special note is the BLM irradiation test that will be carried out via TIM in a collaboration between SY-BI and BE-CEM. The irradiation test is divided into 3 phases. The first one includes the communication test with the BLM system and was done in February 2021. Phase 2 consists of the procedure validation in a full sector and during phase 3 all sectors will be tested. The planning for phase 2 and 3 will have to be revisited due to the constraints posed by the warm-up of sector 78.

Discussion

J. Uythoven asked during the presentation how 6 BLMs per hour speed of the TIM for irradiation test compares to a person doing the same task. B. Salvachua answered that the speed is comparable to a person but for the TIM there is potentially a significant performance improvement margin after an initial testing experience. Also, B. Salvachua commented that TIM will significantly reduce dose to personnel during this activity.

J. Wenninger asked if the BLM name changes are already propagated to the relevant databases. B. Salvachua replied that this task is not finished yet. The layout database is undergoing many modifications and when ready the BLM changes will be implemented there and automatically propagated to LSA (expecting to be done in June).

D. Wollmann asked for clarification about the changes in the diamond BLM system.

B. Salvachua answered that they were out of the scope of the presentation and will be presented by SY-BI at the LBOC end of May.

Re-commissioning of the BLM System (C. Zamantzas)

C. Zamantzas presented the re-commissioning steps after LS2 and the summary of the software and firmware changes.

Re-commissioning tests have been summarized as well as the pending tasks to be done before considering the BLM system in nominal conditions. To be closely coordinated with BE-OP-LHC because test order can be fine tuned and potentially be done in parallel with other activities.

During LS2 outstanding issues were corrected including:
- BLM cards exchange
- enabled card reset via WorldFIP
- updated BST with timestamps fix
- updated dependant applications to latest BE-CSS libraries

BLM concentrators are ported to latest BE-CSS changes. A UCAP version of the concentrator will be running for validation in parallel with the main system. Moreover, all LHC BLM historical data has been transferred successfully to NXCALS.
IQC and UFO Buster systems are still to be tested and validated.

Outstanding issues:
- signal drop at IP3 reported twice during Run 2: solution has been identified and will be applied this year
- BLMs at the DUMPs: proposed solution is to add 6 ICs and 1 LIC per DUMP. There is still an open question regarding the need to add a filter to the IC signal behind the dump to avoid saturation (Action C. Wiesner, A. Lechner and Y. Dutheil).

Discussion

A. Lechner asked for clarification for the blindable BLM and the impact of making a BLM blindable later in the year. C. Zamantzas answered that it is possible to do it even late in the year, but requires the whole crate to become blindable.
A. Lechner asked as well about the SDDS format that is currently used in the UFO Buster application. Using the Post Mortem in the UFO Buster was discussed and followed up (Action A. Lechner, J.C. Garnier and C. Zamantzas)
C. Wiesner asked for clarifications on the need to add a filter on the signal of the BLMs behind the dumps to avoid saturation. This will be studied and followed up.

Actions

- Check if energy extraction switches opening signal sent from SIS is correctly received by the CIRCUIT SCADA (J. Wenninger and A. Antoine)
- Check if the Beta* and energy gap interlock functionality is implemented in the TCDIs (Y. Dutheil)
- Evaluate feasibility of implementing interlock based on the correct transfer line optics ID generated by SIS. SIS is sending 0 as optics ID in case the optics cannot be reconstructed from the FGCs input of the transfer line (J. Wenninger)
- Add TDE N2 pressure interlock gauges to SIS following LS2 updates (J. Wenninger)
- Evaluate feasibility of porting UFO Buster data acquisition from SDDS files to Post Mortem (A. Lechner, J.C. Garnier and C. Zamantzas)
- Decide if a filter on the signal of the BLMs behind the dumps is needed to avoid saturation (C. Wiesner, A. Lechner and Y. Dutheil)