232nd Machine Protection Panel Meeting (LHC)

Friday 24 February 2023 (Zoom)

Indico MPP Website

Participants

F. Alessio (EP-LBC), A. Antoine (TE-MPE), A. Calia (BE-OP), M. Deile (EP-CMT), M. Gasior (SY-BI), M. Hostettler (BE-OP), D. Jacquet (BE-OP), A. Lechner (SY-STI), T. Levens (SY-BI), B. Lindstrom (BE-ABP), D. Louro Alves (SY-BI), D. Nisbet (SY-EPC), B. Salvachua Ferrando (SY-BI), R. Secondo (TE-MPE), E. Thomas (EP-LBO), J. Wenninger (BE-OP), C. Wiesner (TE-MPE), D. Wollmann (TE-MPE)

Minutes from previous LHC MPP meetings

No comment was raised regarding the minutes of previous MPP LHC meetings. Therefore, the circulated minutes are considered approved.

D. Wollmann commented that the ECR for the BCCM has been approved (EDMS).

Experience and 2023 plans on luminosity levelling and lumi server (M. Hostettler)

M. Hostettler presented the machine protection aspects of the luminosity levelling strategy for 2023 implemented in the lumi server (operational server + GUI in the CCC).

As a recap, the lumi server was used operationally in 2017 for crossing angle change and in 2018 for Beta* levelling at the end of fill. Nothing is fundamentally new in the lumi server logic, the functionalities needed for 2023 configuration were already introduced in 2022 and successfully tested.

M. Hostettler then explained the settings management aspects of the lumi server Beta* levelling implementation. All the settings are in LSA and generated per optics matchpoint. With this the lumi server is able to move between optics matchpoints. Conceptually it is not much different than a standard squeeze in step done via the sequencer during commissioning.

M. Hostettler stressed that the lumi server should never become critical for machine protection. Collimators movement is checked by the collimator system interlocks and the magnets are protected by the PcInterlock. This creates a safe envelope that allows the lumi server to not become a critical system.

M. Hostettler then presented a recap of 2022 B* levelling operation, where B* was reduced from 60cm to 30cm with constant collimator interlock settings. In 2022 MD7003, the configuration of 2023 was successfully tested. In 2023 configuration, during B* levelling, the

crossing angle will be reduced and, consequently, the TCT/TCL position and interlock threshold will be driven by the lumi server.

M. Hostettler presented an update on the possible failure scenarios of collimator settings handling of the lumi server.

Failure scenario 1: due to a bug in the lumi server the wrong limit function is loaded for the collimators. In this scenario, the collimators PRS checks for continuity of the loaded functions and will throw an exception during the set on the hardware. Also, the best effort check will make sure that the jaws positions and collimator limits are in accordance. In the worst case, the collimator limit interlock will protect the machine by dumping the beam. Thus, this failure case would only manifest if two collimator limit segments start at the same value in LSA and the lumi server chooses the wrong one, along with consistent jaw position functions. The limits foreseen for Run 3 are monotonic, excluding such a scenario.

Failure scenario 2: collimators are not driven. Moving the collimators (and limits) during a Beta* levelling step is an option in the GUI that can be disabled (useful for MDs). In this case, the machine is still protected by the Beta* interlock on the collimators, which are stored in a separate beam process and are not touched.

M. Hostettler concluded that B* levelling was successfully used in 2022 and no showstoppers are expected for 2023 as the software functionalities were tested in MD7003.

More information about the B* strategy can be found in the LHC Collimation Working Group #256 and #260 and Machine Protection Panel #222.

Discussion

D. Wollmann commented that the failure scenarios are ok and the safety net should be defined by the collimators interlock system and PcInterlock. Collimation team, represented by Bjorn, will validate with M. Hostettler the settings for 2023 (**Action** for M. Hostettler and Collimation team).

D. Wollmann commented that the interlock functions are monotonous for the 2023 run, but in the future they could change. This could potentially make the lumi server choose the wrong interlock function segment to drive. M. Hostettler commented that this case is not checked (by lumi server or settings generation code) but it could be added. J. Wenninger comments that the checks should allow sufficient flexibility for MDs and special requests. M. Hostettler will provide a proposal for this check to be implemented (**Action** for M. Hostettler).

R. Secondo asked if there is an update to the B* upper and lower limits checks performed by the SMP. J. Wenninger answered that the there are no further restrictions to be included in the B* checks on the SMP side.

R. Secondo, D. Wollmann, we need to find a long term solution for the B* reconstruction in the SMP (nothing to be done now, another discussion already in the pipeline).

BCCM strategy for 2023 (M.Gasior, T.Levens)

Beam Charge Change Monitor is a system designed to detect, and interlock, global beam losses.

M. Gasior explained the system status and strategy for 2023. BCCM Systems A and B (based on BPM signals) are already installed and have been intensively tested durig the 2022 Run. During the intensity ramp-up the systems will be further validated before they will be made operational. System C (based so far on BCT signals) still needs to be further developed and for the moment it will not be kept as development system and not made operational.

M. Gasior concluded that there should be no showstoppers to make the BCCM system operational this year.

Discussion

M. Hostettler commented that the performance of the system is remarkable and asked if this could be used to derive the beam lifetime. M. Gasior answered that they are looking into it but the study is in the early stages.

Since the project is showing very promising results, D. Wollmann asked if it would be possible to make the BCCM operational during LHC TS1. M. Gasior answered that a commissioning procedure is being prepared and it would require not much machine time since it can be done at injection energy.

C. Wiesner asked for clarifications about the status of the Post Mortem data of the BCCM. M. Gasior answered that the PM support on the controls side of the BCCM is almost ready. D. Wollmann commented that the PM trigger of the BCCM system should be checked before making it operational (**Action** for M. Gasior and C. Wiesner).

D. Wollmann concluded that a few weeks before TS1, as an AOB at the MPP, the operational details of the BCCM will be presented.

AOB - MPS re-commissioning checklists (D.Wollmann, C.Hernalsteens)

D. Wollmann presented the status of the commissioning checklist for 2023. The statuses of the MPS tree have been reset and he presented a summary of the checklist procedures of the various MPS systems.

D. Wollmann concluded with a reminder for system responsibles to update the MPS procedures in view of the commissioning of 2023.

Discussion

D. Wollmann asked M. Deile if a MPS procedure for TOTEM (and similarly for CTPPS and ARP) can be derived from the internal report already in place. M. Deile answered that this can be done and D. Wollmann proposed that this is to be done with C. Hernalsteens (**Action** for M. Deile and C. Hernalsteens)

D. Wollmann proposes to not perform tests with FMCM masked. The only FMCM triggering test with beam will be at flat-top for RD1.LR1. After a discussion with A. Antoine, D. Wollmann suggested to prepare procedure to ensure the efficient and correct performance of the test by OP (**Action** for A. Antoine and J. Wenninger)

D. Wollmann asked for clarifications about the status of the blindable BLMs commissioning strategy. B. Salvachua answered that, after discussing with Chiara, based on 2022 data it should not be necessary to use blindable BLMs in 2023. D. Wollmann commented that even if the system will not be used it would be interesting to commission it to gain experience and be ready for unforeseen scenarios. D. Wollmann proposed to discuss offline and define how to proceed (**Action** for B. Salvachua, C. Bracco and D. Wollmann).

Actions

- Validate collimator settings for B* levelling 2023 scenario (M. Hostettler and Collimation team)
- Provide a proposal for checks on collimator interlock settings (M. Hostettler).
- Verify PM trigger of the BCCM system before making it operational (M. Gasior and C. Wiesner).
- MPS procedure for TOTEM (and similarly for CTPPS and ARP) (M. Deile and C. Hernalsteens)
- Provide a procedure to OP for FMCM triggering tests (A. Antoine and J. Wenninger)
- Decide if blindable BLMs should be commissioned in 2023 (B. Salvachua, C. Bracco and D. Wollmann).