217th Machine Protection Panel Meeting (LHC)

Friday 19 November 2021 (Zoom)
Indico MPP Website

Participants

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Minutes from previous LHC MPP meetings

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

BCCM and BPF commissioning procedures (M. Gasior)

M. Gasior presented the draft of the EDMS document to be published, describing the machine protection commissioning aspects of the Beam Presence Flag (BPF) system.
In this short document all the tests concerning the BPF system are described in detail.

M. Gasior then showed the draft of the EDMS document about the machine protection commissioning aspects of the Beam Charge Change Monitoring (BCCM) system.
This system has been re-designed to meet the required operational performance of an LHC protection system. The new system is based on the BPM electrode signals and provides 2 redundant systems per LHC beam (each taking input data from different BPMs).
The new BCCM system is not yet operational and it will be tested during the 2022 LHC Run . Therefore, the proposed commissioning procedure will not be part of the machine checkout of 2022. The system will be commissioned and made operational as soon as its performance is confirmed. Most likely this will be at the end of the YETS 2021/22, but could also take place during a technical stop.
A detailed list of the tests to be performed is presented in the EDMS document. Below there is a (non-exhaustive) summary of the most relevant machine protection tests of the BCCM system:

- Test that the BCCM correctly publishes the beam intensity.
- In the event of loss of reception of beam energy from the SMP system, the BCCM switches to high energy range (energy is considered to be > 0.5 TeV). This is tested by manually turning off the SMP energy reception via software.

- Test that the BCCM correctly triggers beam dump when thresholds are exceeded.
- Test that BCCM switches to high energy range during the ramp when transitioning beam energy over 0.5 TeV.

Discussion about BPF commissioning procedure

J. Uythoven asked who runs the proposed tests during operation. R. Secondo commented that the signal from the BPF goes to the Safe Machine Parameters (SMP) system and is then re-published to other systems, e.g. BIS (directly or via the LHC telegram MTG). Therefore, the proposed tests with pilot bunch (section 8.2.1) are already included in the SMP test procedure.
J. Uythoven asked who runs the tests to be done at every pilot injection and at every beam dump. D. Wollmann pointed out that the tests after every pilot injection are done intrinsically by the BIS because otherwise no nominal bunch can be injected in the machine. Regarding the tests after each beam dump, they should be part of the SMP IPOC.
J. Uythoven commented that this is ok but should be clearly stated in the procedure.
R. Secondo commented that he will check the procedure of the SMP to integrate, if needed, the BPF tests in the SMP IPOC (**Action R. Secondo**).
D. Wollmann proposed to circulate the BPF procedure (**Action M. Gasior**).

Discussion about BCCM commissioning procedure

J. Wenninger asked whether the proposed tests will be done parasitically or need special LHC setups. M. Gasior confirmed that the tests can mainly be done parasitically. D. Wollmann commented that it is important to test the correct switching of thresholds as a function of the beam energy at least once.
D. Wollmann raised the question if the BCCM should be connected to two beam BIC inputs instead of single beam inputs. That would have the advantage to dump both beams and not to depend on the software linking of the two beam permits. After a quick discussion with J. Wenninger, it was decided to leave the BCCM to act separately on each beam and use maskable BIS channels.
Following this discussion, D. Wollmann concluded that the usage of a combiner for the integration of the two redundant BCCMs per beam into the BIC is required. This way, redundant beam permits signals can be combined into a single maskable input to the BIS.
M. Gasior and T. Levens commented that from the BCCM point of view, little will change and they are flexible to add a combiner if needed (based on the 2022 experience).
D. Wollmann proposed to circulate the BCCM procedure (**Action M. Gasior**).

Proposal for intensity ramp-up 2022 (C. Wiesner)

C. Wiesner proposed the plan for the intensity ramp-up in 2022. The proposal is similar to the one of the previous years and involves a minimum of 3 fills, more than 20h in stable beams per intensity step and validation via checklist. There are 8 intensity steps foreseen. During the intensity ramp-up, the bunch intensity should be kept to Run 2 values (~1.15e11 ppb). Then, a gentle increase of the bunch intensity, i.e. in steps of 0.05e11, up to 1.4e11 ppb is proposed, depending on the machine behaviour and the available bunch intensity. During the intensity ramp-up the beta* levelling technique needs to be used and validated

Regarding the scrubbing, it is proposed to have an intermediate scrubbing checklist after around 300 bunches and a final checklist at the end of the scrubbing run.
During the Run, Cruise Checklists are planned every ~8 weeks, e.g. between Technical Stops, to check the behaviour of the machine-protection systems.
The various checklist tasks will have to be reviewed before February 2022 by the system experts for final validation.

Discussion

J. Wenninger commented about the flickering behavior of the QPS ok signal observed during the beam test. D. Wollmann replied that the issue is known and the QPS and SW teams are working on a solution. He will contact the teams again.
J. Wenninger commented that the roman pots should be inserted before the beta* levelling steps. D. Wollmann asked if the roman pots will be put in a fixed position in 2022. J. Wenninger answered that as of this moment, there is no official decision about changing position during stable beams. J. Wenninger, D. Wollmann and M. Trzebinski discussed the different insertion scenarios of the roman pots during the intensity ramp-up. In summary:

- roman pots will be inserted during the first fill of the intensity step, with nominal settings and before the first beta* levelling step.
- ALFA will not be used for the low beta* high intensity run but it would be useful to insert it during the first step of intensity ramp-up up to 300 or 600 bunches.

J. Wenninger commented as well that after each technical stop the beta* levelling procedure has to be validated again. D. Wollmann asked if the software allows quick consecutive steps of beta* levelling to be perhaps done when coming back from a technical stop. J. Wenninger answered that indeed it is possible to do, but it should then be clearly stated in the procedure if the steps are allowed to be done consecutively. This point is important as the lower intensity fills are kept usually fairly short.
J. Uythoven pointed out that a high pileup due to beta* levelling step verification after technical stops might be a problem for the experiments. There are possible mitigations in case this is a problem. The LPC will verify with the experiments if the increased pile-up during low intensity fills of the intensity ramp-up after a technical stop could cause any issues. (**Action F. Moortgat**)
The MPP approved the proposal for the intensity ramp-up.

Actions

- Include BPF tests in the SMP IPOC procedure (R. Secondo)
- Update SMP procedure and add that the BPF checks after each injection are done implicitly by the BIS (R. Secondo)
- Circulate the BPF procedure (M. Gasior)
- Circulate the BCCM procedure (M. Gasior)
- Verify high pileup implications (while validating beta* levelling steps) during intensity ramp-up after a Technical Stop with experiments (F. Moortgat)

Corrections

- “ALFA will not be used for the low beta* high intensity run but it would be useful to insert it during the first step of intensity ramp-up at 300 or 600 bunches.” → “ALFA will not be used for the low beta* high intensity run but it would be useful to insert it during the first step of intensity ramp-up up to 300 or 600 bunches.” (M. Trzebinski)