

196th Meeting of the Machine Protection Panel (LHC topics)

LHC topics

November 6th, 2020 via Zoom

Participants:

Chiara Bracco (TE-ABT), Roderik Bruce (BE-ABP), Andrew Butterworth (BE-RF), Mario Deile (EP-CMT), Cédric Hernalsteens (TE-MPE), Dragoslav Lazic (EP-UCM), Ivan Lopez Paz (EP-UAT), Marko Milovanovic (EP-LBD), Filip Moortgat (EP-CMG), Brian Petersen (EP-ADT), Michael Rijssenbeek (EP-UAT), Belen Salvachua (BE-BI), Benoit Salvant (BE-ABP), Matteo Solfaroli (BE-OP), Maciej Trzebinski (EP-UAT), Jorg Wenninger (BE-OP), Christoph Wiesner (TE-MPE), Daniel Wollmann (TE-MPE), Markus Zerlauth (TE-MPE).

The slides of all presentations can be found on the [website of the Machine Protection Panel](#) and on [Indico \(196th meeting\)](#).

Minutes from the 195th MPP meeting (LHC topics)

- The minutes of the 195th MPP meeting were not available at this time.

Status update on change in ALFA and AFP XRP's during LS2 (Ivan Lopez Paz, Maciej Trzebinski, Michael Rijssenbeek)

Ivan first summarized the current detector status for ARP (Atlas Roman Pots, ALFA + AFP). The ALFA detector “far” station MBs are pending replacement. The AFP “near” roman pots in both sides of the IP are equipped with detectors. The detectors for the “far” stations will be installed next year.

The following issues are covered by this presentation: (a) station not reaching home position when self-retracting, (b) spikes observed on LVDTs, and (c) the concern of roman pots heating for higher intensities during run III.

For the roman pots’ movement, the electronics has been changed from PXI/FESA to FESA: the hardware changes have been performed, however the software has not been updated due to issues with Linux driver support with PXI. This will remain like this for Run 3.

Question: Daniel asked about the software status and what is the consequence of not upgrading it. Ivan replied that the software will not evolve to FESA as there is an issue with the drivers, but the device will function as in the past. There are no consequences from an operational point of view.

(b) In the past, issues were observed when LVDT spikes caused the self-extraction of the roman pots. It has been found that the issue is correlated with the cycle of the vacuum pumps via a crosstalk in a common cable. In 2018 a solution has been put in place for AFP, using a separate cable for the LVDT readout and for the powering of the vacuum pumps. This modification fixed the issue. As ALFA doesn't have spare cables to separate the LVDT readout from the vacuum pump, a decision has been taken to keep the vacuum pumps running at all times during ALFA operation, i.e. special runs.

(a) When self-retracting, in some instances, the stations did not reach their home position. An initial mitigation measure was to add some soft springs to aid the retraction. In a final solution, a cable holder has been installed to relieve stress induced by the weight of the cables. For the moment the cable holder has only been installed in the "C-near" station. Initial tests confirmed that the XRP reaches its home position and gets closer to the hardware limit than before. A final test will be done with the FAR stations when they are fully equipped with detectors, as they have a higher weight, due to the additional TOF detectors.

Question: Daniel asked if it is planned to perform reliability tests with multiple retractions to evaluate how solid the solution is. Maciej commented that final checks will be done when everything is installed and that there are no limitations to perform the tests multiple times. Maciej also mentioned that a good time slot to perform these tests is after the alignment of the XRPs with the survey team.

Question: Belen asked if there is a backup solution. Maciej replied that the additional soft springs can be reinstalled easily. Maciej also mentioned that the self-retraction occurs if the power to the motors is cut. In the past, the motors were cut at every beam dump, when the operational mode switched from stable beams to beam dump, and the self-retraction was happening. Already in 2018, the XRPs were removed before each programmed beam dump using the motors.

Question: Daniel asked if a re-alignment will be needed in case the soft springs have to be re-installed. Maciej replied that a very small tension is required and that no noticeable effect is expected.

(c) A beam induced temperature increase in the detectors is expected during Run 3. Based on extrapolations, an increase of up to 50 degrees is expected in the AFP far station. To mitigate that issue, the heat exchangers for the SiT detectors are replaced with new Al-foam-filled heat exchangers. An improvement of 20% in cooling is expected. Additionally, in case of a too large temperature increase, the pots can be retracted slightly.

Comment: Benoit and Jorg commented that the heating would come from the increased beam current, not so much from the higher luminosity and that it will also affect the XRP parts in the beam vacuum.

Action (M. Trzebinski/EP-UAT): Verify the maximum allowed XRP temperature with TE-VSC, taking into account outgassing and the temperature of the ferrites.

Ivan then presented the installation schedule for AFP. The baseline is January 2021 but some detectors might arrive later. The fallback plan is to perform the installation in July 2021. An alignment campaign will be performed after the installation (2 weeks) requiring the presence of AFP experts, ALFA experts, the LHC survey team and Xavier Pons.

The optics for the special physics runs is being discussed with the collimation team. ALFA will request a special run with beta* larger than 3 km if the LHC operates above 6.5 TeV. AFP will go in during all fills, while ALFA will only operate during the high-beta fills.

Comment: Jorg pointed out that the period after the beam test in September 2021 will 'resemble' a YETS, all major LHC industrial systems (CV, EL and cryo) will perform maintenance in the period from mid-October 2021 to early January 2022. As a consequence, BE-OP and EN-ACE aim to move most activities of the experiments to that end of year period, in particular activities that are not compatible with the nominal cryogenic conditions or that go beyond short localized access; the alignment of RPs falls into that category. In addition, it makes much more sense to align as late as possible.

Summary of actions

The actions from the meeting are:

1. Verify the maximum allowed XRP temperature with TE-VSC, taking into account outgassing and the temperature of the ferrites (M. Trzebinski/EP-UAT).