

# 248<sup>th</sup> Meeting of the Machine Protection Panel

## LHC topics

April 23<sup>rd</sup>, 2024.

### *Participants:*

*Federico Alessio (EP-LBC), Riccardo De Maria (BE-ABP), Lorenzo Giacomel (BE-ABP), Cedric Hernalsteens (TE-MPE), Anton Lechner (SY-STI), Antonio Perillo Marconne (SY-STI), Anastazia Radeva Poncet (BE-CSS), Giovanni Romulo (BE-ABP), Benoit Salvant (BE-ABP), Matteo Solfaroli (BE-OP), Jan Uythoven (TE-MPE) Jorg Wenninger (BE-OP), Christoph Wiesner (TE-MPE), Daniel Wollmann (TE-MPE), Christopher Young (EP-ADP), Carlo Zannini (BE-ABP).*

The slides of all presentations can be found on the [website of the Machine Protection Panel](#) and on [Indico \(248<sup>th</sup> meeting\)](#).

## Minutes and actions from the previous meetings

The minutes of the 246<sup>th</sup> and 247<sup>th</sup> meetings are still pending. Daniel recalled the agreed actions. In particular, the IR7 interlocking [BLM changes have been performed](#). The interlocking BLMs for the TCP.C for B1, TCP.B for B1 and TCL.A.B2 have been moved to the corresponding “Wall BLM”. The old monitors are not anymore interlocking the BIS, while the wall monitors are. However, the data are still recorded and can be used for monitoring and comparison.

## Proposal for a reduced TDIS parking position (A. Lechner)

Anton summarized the issue presented at the [483<sup>rd</sup> LMC](#). Both TDIS have non-conform bellows and no spare module will be available before September 2024. The presently installed modules will be swapped with spares having the new bellows during YETS24-25.

While it is expected that the non-conform bellows can sustain the stress from the operational cycles in 2024, it is proposed to reduce the parking position from a half-gap of 55 mm down to 40 mm to reduce the constraints on the bellows. The choice of the 40 mm half-gap is not compatible with the acceptance of the ALICE ZDC for Pb operation nor for the proton Van der Meer cycle.

The strongest e-cloud is expected with a half-gap of 35 to 45 mm. For this reason, a dedicated half-gap of 45 mm was used during the scrubbing run to condition the devices as much as possible. It was shown that it is possible to have a full machine with this half-gap without issue, at least at injection. Similarly, no issue is expected when using a reduced gap in physics.

Daniel asked if the settings can be changed easily for the Van der Meer or Pb cycles. Matteo confirmed that this is the case.

Cedric asked if further vacuum conditioning is expected. Anton replied that the vacuum levels reached at the end of the scrubbing period are already very low.

## Aperture considerations for the new TDIS parking (R. De Maria)

Riccardo detailed the aperture margins for the TDIS in IR2 and IR8, at injection and at flat-top. For IR2, the tip of the jaw gets closer to Beam 1 and Beam 2 but not significantly. At flat-top, the emittances are reduced but the beta\* value remains the same (10 m), leading to more aperture margin. In IR8, at injection and at flat-top, before and after the crossing plane rotation, no issue is expected. Similarly, for the proton-proton reference run at 2.68 TeV, no issue is expected from a point of view of aperture.

Antonio and Matteo proposed to open the parking position to 55 mm only when strictly required. The 40 mm gap would be kept for all cycles that allow it.

## Impedance considerations for the new TDIS parking (L. Giacometti)

Lorenzo started by briefly summarizing the impedance contributions at flat-top. At flat top the collimators are the largest impedance contributor (up to 90% of the total impedance). When decreasing the half-gap to 40 mm from 55 mm, the impedance of the TDIS increases by a factor 2.5 for both transverse planes. However, the total impedance increase is minimal as the TDIS impedance remains low compared to other collimators.

Regarding the longitudinal impedance, responsible for beam-induced heating, computations were performed with BIHC. It increases by a factor 1.4.

Anton asked which beam parameters were used for the computations. Lorenzo replied that he considered a machine filled with 2880 bunches using 288b (4x72b) injections of the standard scheme, and a bunch intensity of  $1.6 \times 10^{11}$  protons.

Daniel asked if the results shown are the total for the three sets of jaws. Lorenzo confirmed. Nicolas commented that the graphite block will be dominating.

Benoit asked if the results account for HOM. Lorenzo and Nicolas replied that this is not the case. Benoit added that in case the 40 mm half-gap is a local “bad spot” for the HOM the value could be changed by 2 to 3 mm.

## Discussion

The discussion converged towards the agreement of performing the first fill with new settings during daytime so that experts would be warned in advance and would be able to monitor closely the temperature and local pressure. This was agreed.

## Implementation

The new settings were put in place on Friday April 26. On the same day, for fill 9566 with 2211 bunches the TDIS were retracted to 40 mm while experts were monitoring. No issue was observed, and preliminary results were shown at the [LHC morning meeting](#).

## Summary of actions

No action was identified during the meeting.