rMPP meeting on MD6 (ion MDs) 2024 approval

The meeting took place on Thursday, **November 7th, 2024, 15.30h-16.30h,** via zoom.

Participants: R. Bruce, Y. Dutheil, P. Hermes, K. Lasocha, S. Le Naour, C. E. Montanari, S. Morales, G. Sterbini, B. Salvachua Ferrando, M. Solfaroli Camillocci, G. Trad, N. Triantafyllou, J. Uythoven, A. Verweij, C. Wiesner, M. Zampetakis

The slides of all presentations can be found on Indico. The MD procedures can be found on ASM.

1 Introduction

J. Uythoven welcomed the participants. He explained that, prior to the meeting, rMPP core members had reviewed the MD procedures and selected two MDs that should be presented and discussed in more detail, as well as six MDs for which comments will be given.

2 rMPP comments on MDs

C. Wiesner presented the rMPP comments on the following MDs (see here). The following clarifications and comments were given in the meeting:

- **MD10703: Ions BB limit varying the crossing angles**
  - G. Sterbini clarified that **a full set of loss maps (H, V, off-momentum, ASD test) will be performed for the configuration with the smallest crossing angle**. He added that the crossing angle will be reduced in small steps monitoring the beam lifetime.
  - G. Sterbini confirmed that the **TCTs gaps will be kept constant,** but the centre positions will be changed accordingly, which requires opening the position limits.
  - G. Sterbini confirmed that the desired filling scheme has not changed since the MD request in 2023 and that the operational bunch intensity will be used during the MD.
  - R. Bruce commented that with two trains (119 bunches per beam) one cannot reproduce the desired long-range and head-on beam-beam effects in all IPs. Therefore, three trains (160 bunches per beam) are requested. **It was decided that 160 bunches per beam are acceptable after the successful validation of the loss maps**.
- **MD14364: RF flat bottom optimization for ion debunching**
  - M. Zampetakis clarified that the FESA class foreseen for the batch-by-batch blow-up is independent from the implementations used for the blow-up in the operational cycles. Nevertheless, he added that the migration cannot be performed before the MD. Therefore, **the batch-by-batch blow-up will not be used during the MD, and the procedure will be adapted accordingly**.
- **MD14363: Off-Momentum Beam Loss Patterns with Ions**
  - B. Salvachua Ferrando clarified that the priority is to perform the scraping at injection energy. However, the MD will now be performed together with MD14343, which would **allow scraping at top energy if enough intensity remained. B. Salvachua Ferrando confirmed that this will be clarified in the MD procedure.**

- **MD14343: Schottky-based diagnostics with ion beam**
  - K. Lasocha reported that, based on a discussion with F. Roncarolo (BI), the **intensity limit for using the wire scanners with Pb ions at top energy is 6e10 for an emittance of 2 µm** in order to avoid damage to the wires. He added that the beam losses are expected to reach 50% of the local BLM thresholds during a wire scan at top energy.
  - K. Lasocha confirmed that the **MD procedure will be updated with the total beam intensity of 6e10 and the minimum transverse emittances (≥2µm**).
  - After the meeting, A. Lechner stated that the magnet that is most likely to quench due to losses originating from the wire scanner is the D4 separation dipole. He estimated that for the given parameters the energy deposition in the D4 will be a factor 50 below the quench limit. Thus, there should not be a risk of quenching the D4 magnet.
- **MD14326: Optimization of machine-induced backgrounds at ALICE**
  - J. Uythoven reported that this MD was not scheduled for MD block 6. R. Bruce complemented that there is currently no strong request to perform these tests. However, if the situation changes, he will send an update with the foreseen test procedure.
- **MD14324: LHC cycle with high-intensity Pb ion beams from injectors**
  - R. Bruce explained that the different beam types with different bunch spacing can lead to systematic offsets in the BPM readings. Therefore, **these offsets have to be measured and corrected. He confirmed that this will be done at injection energy after the injection of the first train.**
  - C. Wiesner reported that B. Salvant confirmed that no issue with beam-induced heating is expected for the foreseen beam parameters.
  - R. Bruce commented that it is not yet clear which beam type will be used for the MD but that this information will be added to the MD procedure as soon as a decision has been taken.

The MDs were approved understanding that the clarifications and modifications above will be included in the procedures.

3 MD14325: Tests with full squeeze in the ramp in ion cycle (N. Triantafyllou)

The goal of the MD is to test the full squeeze in the ramp and understand the origins of the losses observed during 2023 operation.

Three ramps are foreseen during the MD, using the 2024 collimator settings:

- 1st ramp: Ramp with set-up beam intensity to acquire feed-forward corrections on the orbit.
- 2nd ramp: Ramp with set-up beam intensity to a) implement and test feed-forward corrections and b) perform loss maps in the ramp and at flat top, including an Asynchronous Beam Dump Test.
- 3rd ramp: Ramp with 119 bunches.

N. Triantafyllou confirmed that **119 bunches are enough to observe the losses in the ramp and that no higher intensity is requested**.

The following remarks and clarifications were given in the meeting:

- M. Solfaroli Camillocci remarked that in the first fill also the feed-forward corrections for the tune should be checked.

- M. Solfaroli Camillocci asked which values will be used for the TCT centres. After a short discussion, **it was decided to check the TCT centres in the first fill, realign them when needed, and then use the new centres for the second fill when performing the loss maps**.
- B. Salvachua Ferrando commented that in case that the loss behaviour is different with respect to the loss maps, there won't be time to apply any corrections, and the only option would be to adapt the monitor factor. R. Bruce replied that he does not expect any issue with only 119 bunches.

The MD was approved understanding that the clarifications and modifications above will be included in the procedure.

4 MD10723: Crystal collimation quench test with heavy ions (P. Hermes)

The goal of the MD is to probe the limitations imposed by collimation losses with crystal collimation and to estimate the quench limits.

The following remarks and clarifications were given in the meeting:

- R. Bruce commented that the assumed 2e10 charges per bunch have not yet been demonstrated in the LHC, but the feasibility will be known within the coming week. P. Hermes replied that in case of lower bunch charge the total number of bunches could be increased.
- P. Hermes explained that it is foreseen to create steady state losses of 60 kW (first fill) and 100 kW (second and third fill) over 10 s.
    - R. Bruce remarked that there is a high chance of quenching already with 60 kW. B. Salvachua Ferrando reminded that the present BLM master thresholds are corresponding to 60 kW losses. This implies that, to accept 100 kW losses, the master thresholds would need to be modified in all collimator families before the quench test. R. Bruce suggested to **re-check the probability of quenching already with 60 kW. If this scenario is deemed very likely, one could avoid modifying the BLM master thresholds. P. Hermes agreed and stated that the result of the discussion with the BLM team will be communicated to rMPP.**
- P. Hermes remarked that D. Valuch will be present during the MD and that the tool for the ADT excitation will be tested first at injection energy and then on individual bunches at top energy before starting with the actual excitation for the quench attempt.
- J. Uythoven reported that A. Verweij confirmed for MP3 that there are no known non-conformities in the concerned magnets.
- R. Bruce commented that, before starting the quench test, the crystals will be aligned to be in channelling positions as during a nominal physics fill. However, during the excitation a certain fraction of the particles might have a different angle and not remain in channelling. J. Uythoven added that losing the channelling condition will increase the losses. R. Bruce agreed and complemented that in this case it's almost certain that one would quench. P. Hermes commented that the ADT kick is small compared to the channeling acceptance. C. Wiesner asked if heating of the crystal due to beam losses could play a role. P. Hermes agreed that this could indeed lead to a loss of the channelling condition and emphasized that it is difficult to calculate.

The MD was approved understanding that the clarifications and modifications above will be included in the procedure.

J. Uythoven thanked all speakers and participants and closed the meeting.