

rMPP meeting on MD1 2024 approval

The meeting took place on Friday, **May 03rd, 2024, 10.00h-11.00h**, via zoom.

Participants:

A. Butterworth, H. Bartosik, R. De Maria, D. Di Croce, Y. Dutheil, A. Fornara, P. Hermes, C. Hernalsteens, G. Iadarola, B. Karlsen-Baek, S. Kostoglou, E. Lamb, M. Solfaroli Camillocci, R. Steerenberg, G. Sterbini, G. Trad, J. Uythoven, F. Van Der Veken, C. Wiesner, D. Wollmann, M. Zampetakis, P. Ziegler

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 started with a general comment. Currently, updates to the MD procedure in ASM are not traceable, i.e. the date of the last change is not recorded. The rMPP review is based on the version of the MD procedure that is submitted before the request deadline. He stressed that it is possible and encouraged to update and improve the MD procedure afterwards, however, **the changes should be announced and summarised in an email to the MD coordinators (G. Iadarola, G. Trad, J. Uythoven) and the rMPP chairpersons (J. Uythoven, C. Wiesner)**.

2 rMPP comments on MDs

C. Wiesner explained that, prior to the meeting, rMPP core members had reviewed the MD procedures and selected the MDs that should be presented and discussed in more detail.

Independently, comments to two additional MDs were given and discussed. The initial comments and questions can be found [here](#). The following remarks and clarifications were given in the meeting:

- MD11703: Machine Learning for beam dynamics simulations
 - Collimation settings
 - D. Di Croce clarified that **not the standard coarse settings will be used but special settings with the primary collimators at 11 sigma, the secondary collimators at 11.5 sigma, the TCTs at their nominal setting of 13 sigma, and the TDIS at their commissioning settings of 10 mm**.
 - F. Van Der Veken confirmed that the settings are fine for the collimation team and that the ABT colleagues agreed to the TDIS settings.
 - C. Wiesner asked about the collimation settings in IR3. F. Van Der Veken replied that in IR3 the standard coarse setting of 15 sigma will be used.
 - D. Wollmann asked if the collimator movements will be implemented as a sequence. F. Van Der Veken answered that indeed a sequence should be prepared for the MD.
 - D. Di Croce agreed to update the procedure accordingly.
 - Beam intensity
 - D. Di Croce clarified that a **bunch intensity of 0.7e11 protons is foreseen, with a maximum number of 6 bunches**, staying below a total intensity of 5e11 protons. He added that the MD procedure has already been updated.

- G. Trad asked how the number of bunches is chosen. D. Di Croce replied that this is a compromise between having higher statistics for each setting but being fast enough to be able to measure various settings. F. Van Der Veken complemented that the bunches should behave like a nominal bunch but with lower intensity to be closer to the single particle dynamics. Therefore, this is not equivalent to a smaller number of bunches with higher intensity.
- D. Di Croce and F. Van Der Veken clarified that a dedicated beam with 3 bunches per injection spaced by 2 μs would be desired from the SPS. This configuration has been used previously for a crystal collimation MD. G. Iadarola and J. Uythoven commented that this beam type nevertheless has to be requested explicitly from the injectors and should therefore be clearly stated in the MD procedure.
- MD11786: Threshold of longitudinal loss of Landau damping
 - M. Zampetakis commented that the MD can be performed with single bunches but to save time up to 25 bunches per beam could be used. It was clarified that the 25 bunches would cover the intensity range between $5e9$ and $2.4e11$ protons per bunch (ppb) and one bunch at the time would be injected.
 - B. Karlsen-Baek confirmed that the bunches will be distributed around the ring.

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

3 MD11787: Longitudinal halo scraping (B. Karlsen-Baek)

- B. Karlsen-Baek clarified that for this MD **no bunch intensities beyond the operational value of $1.6e11$ ppb are requested**. However, intensities of $1.8e11$ ppb might be requested for future MDs.
- B. Karlsen-Baek clarified that the **outer position limits for the IR3 collimator will not be changed and only the inner limits will be opened to allow scraping with the collimators**. P. Hermes agreed to this approach, and confirmed that the scraping procedure is accepted by the collimation team.
- G. Trad recommended to contact the dBLM experts to ensure the readiness of the devices for the MD.

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

4 MD11243: HL-LHC optics cycle (R. De Maria)

- R. De Maria commented that the first MD parts will be performed at low intensity ($<3e11$ protons). For 2025, MDs with high intensity will be requested, which will require the corresponding machine-protection validation.
- R. De Maria mentioned that a current of 240 A for circuit RQTL8.L7B1 was used in the calculations. However, the circuit is presently only commissioned to 200 A. Since it's impractical

to recommission it to the higher current now and it's not strictly needed for the MD, it will only be operated with ≤ 200 A. M. Solfaroli Camillocci asked if it's then foreseen to change the optics for 2025. R. De Maria replied that this is not the case.

- M. Solfaroli Camillocci commented that the planned three ramps in 8 hours is challenging because there is the risk to lose the beam during the first ramp since a fully new optics is used.
- G. Iadarola asked if the existing orbit corrections can be re-used for the orbit at injection energy. R. De Maria answered that the injection optics is very similar to the existing one. M. Solfaroli Camillocci added that the existing corrections can be used but that **threading has to be performed when injecting for the first time with the new optics.**
- G. Trad recommended that time for the ADT setup should be foreseen before going to high bunch intensity. R. De Maria replied that he will discuss it with the ADT experts.

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

5 MDs: Non-Factorization/VdM (A. Fornara, E. Lamb)

5.1 MD11643: Non-Factorization VdM measurement at LHC injection (E. Lamb)

- E. Lamb clarified that **4 bunches per beam with $1e11$ ppb each** will be used.
- E. Lamb remarked that **only the inner collimator limits will be opened** to allow the scraping. P. Hermes commented that, if not already existing, a dedicated beam process for injection energy could be generated to only open the inner limits, similar to the existing beam process used at top energy. G. Trad asked if this is needed, given the low beam intensity. J. Uythoven remarked that **the settings and procedure should be agreed with the collimation team before the MD and should be added explicitly to the MD procedure.**
- E. Lamb clarified that the TCP will be moved in using steps of $10\ \mu\text{m}$ to $50\ \mu\text{m}$ until 40% of the initial intensity will be lost.

5.2 MD11644: Non-Factorization measurement in collision for VdM (E. Lamb)

- E. Lamb described that end-of-fill scraping is planned after going back from STABLE BEAMS to ADJUST mode.
- E. Lamb explained that no masking of BLM interlocks was foreseen, and that the scraping should be performed until 40% of the initial intensity.
 - P. Hermes confirmed that the scraping procedure is fine for the collimation team.
 - G. Trad asked if the interlock BPMs could be masked after scraping down to below $3e11$ protons. D. Wollmann commented that this should not be done for a test at top energy. He recalled that $3e11$ protons at top energy is not a safe beam and that this intensity can lead to damage to machine components. However, the BEAM_SETUP equation of the Setup Beam Flag allows masking certain interlocks if the beam intensity is below $3e11$. D. Wollmann explained that this flag was implemented for the required setup of the machine but using it in an MD configuration is a different question. **It was decided to not mask any interlock (except the collimator inner limits required for the scraping). It was agreed that in this condition the scraping could continue to below 40% of the initial**

intensity until the beams would be dumped by the BLMs or the interlock BPMs.

H. Bartosik remarked that this indeed would be useful.

- C. Wiesner asked if the results of MD11603 (“Measuring crabbing induced by Head-On Beam Beam”), which is mentioned in the procedure, are needed for this MD. A. Fornara and H. Bartosik replied that the two MDs are independent but there is a synergy because the same teams are involved, and a similar configuration is used.

5.3 MD11603: Measuring crabbing induced by Head-On Beam Beam (A. Fornara)

- A. Fornara explained that it’s foreseen to use one bunch per beam, which is colliding in IP1 at injection energy, with a bunch intensity of 2.1×10^{11} ppb. Then, the crossing angle will be scanned from $170 \mu\text{rad}$ to $-170 \mu\text{rad}$.
- G. Trad asked which collimation setup would be used. A. Fornara replied that collimation settings for non-linear optics at injection were foreseen. M. Solfaroli Camillocci stressed that the green light from the collimation team is required for this MD configuration. F. Van Der Veken agreed to verify the settings together with A. Fornara. **The collimation settings should then be explicitly mentioned in the MD procedure.**

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

J. Uythoven asked all MD contact persons to update their MD procedures accordingly and to send an email once it’s done. He thanked all speakers and participants and closed the meeting.