rMPP meeting on MD2 2024 approval

The meeting took place on Tuesday, **May 28th, 2024, 14.00h-15.00h,** via zoom.

Participants: A. Butterworth, Y. Dutheil, L. Giacomel, C. Hernalsteens, G. Iadarola, K. Paraschou, T. Persson, B. Salvachua Ferrando, J. Uythoven, C. Wiesner, D. Wollmann, 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 explained that, prior to the meeting, rMPP core members had reviewed the MD procedures and selected three MDs that should be presented and discussed in more detail, as well as two MDs for which comments will be given.

2   rMPP comments on MDs

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

- **MD11766: Octupole thresholds - positive vs negative polarity**
  - L. Giacomel stated that the **maximum desired bunch intensity is the operationally used value of ~1.55e11 protons per bunch** (ppb).
- **MD11883: Betatron determination using cogging**
  - T. Persson clarified that it is foreseen to **move the collision point by up to one bunch length, i.e. 4 sigma or 1.2 ns, which corresponds to 35 cm**. He added that this value has been checked with the experiments, who confirmed that it is acceptable. He reminded that in one previous physics fill with full machine the setting was accidently off by one bucket (2.5 ns) without causing obvious issues.

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

3   MD9544: Emittance growth from incoherent electron cloud effects at injection (K. Paraschou)

K. Paraschou introduced the relevant aspects of the MD procedure. The MD will be performed at injection energy using 300b per beam (12b + 2x48b + 2x48b + 2x48) with 1.4e11 ppb. After injecting and waiting for the emittance growth and the tail population to evolve, beam scraping will be performed with the TCPs. The two main parts of the MD consist of a) fills with phase knob switched off (old operational configuration until 2022) and b) fills with phase knob switched on (current operational configuration).

The following remarks and clarifications were given in the meeting:

- Injected train length
  - K. Paraschou commented that it was originally foreseen to inject 3x48b. However, as this is incompatible with the current MKI/AGK settings, it is now planned to use 2x48b, while keeping the total number of bunches.

- Validation loss maps
  - o K. Paraschou confirmed that **the configuration with phase knob set to zero will be validated using the following loss maps: H, V, and off-momentum for injection protection IN and for injection protection OUT**. This will be mentioned explicitly in the MD procedure.
  - o Y. Dutheil stated that an **asynchronous beam dump test is not deemed necessary** for the validation, and that the loss maps should be sufficient to see if there is an issue with the TDIS.
  - o C. Wiesner asked about the validation of the loss maps. K. Paraschou replied that a representative of the collimation team will be present during the MD to validate the loss maps on the spot. J. Uythoven remarked that **the validation of the loss maps has to be mentioned explicitly as a step in the procedure**.
- PC interlock and new hypercycle
  - o In the current configuration, the PC interlock for the MQT trim quadrupoles would prevent the trimming of the phase knob. It was **decided that the preferred option is to use a dedicated hypercycle with the phase knob set to zero and with re-centered power-converter limits**. T. Persson confirmed that this is feasible for OP and that a sequencer task exists to reliably switch between the cycles.
- Retraction of injection protection (TDIS)
  - o Y. Dutheil remarked that leaving the TDIS in would limit the number of mechanical cycles. J. Uythoven complemented that with the current TDIS behaviour and the low beam intensity during the MD, no heating issue is expected for the inserted TDIS. B. Salvachua Ferrando commented that if one wants to avoid seeing losses in IR2 and IR8 during the scraping exercise, the TDIS should be retracted. After a short discussion, **it was decided to retract the TDIS after the injection process to its nominal operational values.**
- Masking of interlocks
  - o C. Wiesner remarked that the MD header and the MD procedure should be made consistent ("Collimation change", "Interlock changes"). D. Wollmann stressed that for the beam scraping the inner position limits for the TCPs have to be opened.
  - o C. Wiesner commented that it was mentioned in the MD procedure that BLM interlocks should be masked. However, as the intensity is above the setup beam flag limit, masking is not possible. B. Salvachua Ferrando confirmed that this is the case and complemented that scraping should still be possible without dumping the beam if performed carefully.
  - o K. Paraschou confirmed that he will update the MD procedure accordingly.

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

4   MD10483: Investigations of UFO release mechanisms using displaced bunches (P. Ziegler)

P. Ziegler introduced the relevant aspects of the MD procedure. The MD consists of two main parts. The first part is performed at injection energy and the second part in collisions at top energy. In both parts, individual bunches are displaced, either by the existing beam-beam effect or by a recurrent kick from the ADT.

The following remarks and clarifications were given in the meeting:
- J. Uythoven remarked that ramping up the ADT kick adiabatically in 10 seconds is indeed beneficial to reduce the risk of instabilities and to increase the time in which the BLMs can react in case of unexpected issues.
- C. Wiesner commented that in the second part of the MD it is foreseen to go to a beta* of 30 cm, which is currently not used operationally because of the collimation hierarchy issue. However, this part of the MD is performed with only 10b in Beam 1 and 300b in Beam 2. D. Wollmann remarked that the hierarchy breakage was observed for Beam 2, and with the proposed filling scheme Beam 2 does not experience any significant beam-beam effect. He concluded that there should be no issue going to a beta* of 30 cm in the proposed configuration. T. Persson agreed and confirmed that no breakage was observed with one weak and one strong beam in the machine as well as for low beam intensities. J. Uythoven concluded that even though no issue is expected, **the collimation hierarchy should be monitored during the MD and in case the hierarchy is evidently broken, the beam should be dumped**. This has to be explicitly mentioned in the MD procedure.

The MD was approved understanding that the modification above will be included in the procedure.

5   MD12263: Weak-Strong investigation of Long-Range Beam-beam (T. Persson)

T. Persson summarised the main aspects of the MD. Beam 1 consists of less than 300b to create the beam-beam effects for Beam 2. The latter consists of 3 pilot bunches to be able to perform optics measurements. The beams will be squeezed to 30cm, the collimators for Beam 2 will be opened to the collimator settings for optics measurements (NLO at 30 cm sequence), and the pilot bunches in Beam 2 will be excited with the AC dipole and the ADT-AC dipole.

The following remarks and clarifications were given in the meeting:
- T. Persson clarified that **Beam 2 will use less than 300 bunches**, and the exact number will be added to the procedure.
- D. Wollmann asked about the excitation with the AC dipole and the ADT-AC dipole. T. Persson confirmed that **only one device will be used at the same time**. He added that the ADT-AC dipole has lower amplitude but longer excitation time than the AC dipole. Y. Dutheil remarked that at RHIC once a Siberian Snake was broken with an AC dipole excitation. D. Wollmann replied that this is the reason why the AC dipole at LHC can only be used with low intensity beams of less than 2e10p+ at top energy.
- B. Salvachua Ferrando suggested to perform a test to verify the behaviour of the Setup Beam Flag with different intensities for Beam 1 and Beam 2 in the machine. The test could be performed at injection energy. T. Persson answered that this is indeed a good idea.
- C. Wiesner asked whether there is a sequence for moving the collimators of only one beam for the NLO configuration. T. Persson replied that there is no existing sequence and that indeed this should be implemented before the MD. will follow up with the collimation team.

During the MD, **the collimation hierarchy should be monitored and in case the hierarchy is evidently broken, the beam should be dumped**.

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

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.