

Present: Markus Zerlauth, Jan Uythoven, Brian Petersen, Stephane Fartoukh, Guido Sterbini, Michaela Schaumann, Yannis Papaphilippou, C.Bracco, R.Bruco, A.Mereghetti, Hugues Thiessen, Nikos Karastathis

The meeting aimed at a discussion and approval of the MDs classified as class 'C' by (r)MPP. The slides presented are available on the following Indico site:

<https://indico.cern.ch/event/742794/>, whereas the final MD schedule as well as all the detailed procedures can be found [here](#).

All MD procedures have been reviewed and the comments and rMPP classification have been set accordingly in the new ASM tool. Minor comments and clarifications for those not classified as Type C (and presented in the rMPP meeting) have been included in the 'Comment' field of the ASM tool and distributed to all MD requestors via mail. In addition, the EDMS approval for the MDs classified C will remain once the procedures have been finalized with the outcome of today's discussion and approval.

MD3583: LR beam-beam 2018 – N.Karastathis ([Slides](#))

The MD foresees bi-directional changes of the crossing angles with specific filling schemes by +/- 30 urad. The filling scheme includes 8b4e which is confirmed to be ready in the injectors. The use of automated sequences is considered to speed up measurements. A second variable to be changed as part of the MD are the phase advance knobs between IP1 and IP5. The plan hereby is to change B1 to make it similar to B2, using a maximum variation of 45 degrees. A phase advance of at least 150 degrees will be maintained at all times between the MKD and TCTs, using a minimum change of phase advance of 25 degrees in both planes. The resulting change of tune while changing the phase advance and the effect on the dynamic aperture are addressed.

Powering the DC wires is foreseen without moving the wire collimators and changing the crossing angle, in turn requiring to compensate with Q4/Q5. Finally the program foresees to perform chromaticity and octupole scans if time still allows.

Roderick enquires about the alignment of the 5th axis and the orbit. Guido mentions that there is a shift in the 5th axis of the wire collimator in IP5 of up to 3 mm, there should be no shift in IP1 (where on the right side the fifth axis is now blocked since the TS1 intervention). Yannis mentions that the effect of a misalignment will be a reduced lifetime and less effect of the wire, hence a better alignment is highly desirable.

Comments and recommendations:

- As we should avoid moving the fifth axis with high intensity beams, the proposal is to check alignment in the wire MD in a prior low-intensity fill (ideally confirmed via loss-maps) and perform the high-intensity MD afterwards (to be confirmed if possible in schedule).
- Stephane mentions that the crossing angle bias knob should first be tested in YASP.
- Concerning the phase advance between MKD and TCT, it was recommended to double-check that the trims foreseen are within the limits of the PC interlocks. This was checked on a previous MD and should be fine according to Stephane.

AOB: switch on/off the active filters – G. Sterbini ([Slides](#))

Guido presented a request to switch off the active filters of the 8 arc dipole converters with pilots in the machine at injection, to investigate the 50 Hz harmonics. This is done in preparation for a test with high

intensity beams at the start of fill for physics. The switching on/off of the filter should not cause considerable perturbations as confirmed by H.Thiesen.

Comments and recommendations:

- Perform first a test with a few nominal at injection (e.g. during the MD time). If successful, perform the same procedure during physic fills during the intensity ramp-up following the MD period or after TS2.
- Stephane questions if the 50 Hz lines are seen on the orbit. As this does not seem to be the case he would rather expect an effect of the quadrupole circuits, which however do not dispose of active filters as the dipole circuits.

MD3284: Partially stripped ions in the LHC – M.Schaumann ([Slides](#))

The MD proposed the injection and acceleration of partially stripped ions in the LHC. In the SPS the Pb81+ life time is observed to be much better than Pb80+, so this is to be used for the LHC MD. Beams have already been extracted to the TT40 and TT60 TEDs. Proposed nominal beam to inject are 2b trains of $8e9$ charges/bunch with a bunch spacing of 200 ns. Trains are to be spaced by > 1 us (but could also use larger batch spacing if desired).

Single bunches were never injected into the SPS and are considered difficult to transfer by the experts. Currently, the max LHC pilot intensity allowed by the SPS SMP is $1.4e10$, so a double batch will be just above it. If the two bunches are scraped down to 50 % however, they could reach $4e9$ each which would be compatible with the current setup beam limits.

The number of bunches needed for the MD is mainly driven by the need to accumulate statistics across the pilot intensity bunches, always staying below $3e11$ for performing loss maps at 6.5 TeV. The same principle was already applied during the Xe run. Roderick and Chiara have no specific worries for this new species if collimator settings are not changed, i.e. at nominal settings. Markus recommended the use of the 'Restricted SBF' instead of the 'BEAM SETUP' flag for such type of MDs, which allows as well a total intensity of $3E11$ but blocks the use of nominal in the filling pattern. In conclusions, no worries were expressed when using only pilot bunches, whereas the total intensity shall not exceed $3e11$ charges.

Loss maps are proposed at the end of the MD, using nominal collimator settings. Stephane mentions that the off-momentum loss maps will be the most interesting loss maps. Roderick will check what is the most interesting.

Comments and recommendations:

- For pilot beam, use standard double-batches which are scraped down in the SPS beam to be well below the LHC pilot intensity limit.
- Use of the 'Restricted SBF' flag for such type of MDs, which allows as well a total intensity of $3E11$ but blocks the use of nominal in the filling pattern via the SIS.

MD3270: ATS round optics – S.Fartoukh ([Procedure](#))

The ATS round optics will be fully qualified for the later use of trains in MD block 3. The plan is for 2 nominals and some pilot bunches, collide with β^* of 65 cm and a crossing angle of 120 urad. Various octupole functions will be tried on the different ramps, with different octupole polarities, three energy ramps are suggested in total (while 2 are absolutely needed for the minimum qualification). Collimation settings for the TCTs were calculated by Alessio (leveraging on the first MD where coarse settings were still used). Some fine alignment of the TCTs at different points during the first cycle, together with some loss maps. Continuous loss maps are foreseen at distinct energies of the ramp.

Off-momentum loss maps are not highest priority now, but will be foreseen to be done during the next 2 MDs planned during the 3rd MD block (which also allows for a re-validation close in time to taking first trains). Roderick and Alessio agree with this strategy. Stephane confirmed that the TCDQ changes are

integrated in its ramp function, hence it will not change direction of movement during the cycle (which could create possible problems with the mechanical play of the current mechanics when changing the direction). Stephane explains that the idea is not to open, but to adapt the ramp function, while staying within the BETS limit.

Comments and recommendations:

- Agreed to foresee off-momentum loss-maps only in preparation of the next 2 MDs in block #3 (see as well later the statement for loss-map pre-requisites for initial train qualification)
- Open TCDQ in round optics MD is OK with the collimation team.
- Following an offline-discussion it should be discussed with the COLL team whether the TCLs could be aligned and functions implemented in parallel with the TCTs. They are not required for this MD, but their inclusion in the validation fills might save time for subsequent MDs and an eventual intensity ramp-up.

MD2148: ATS flat optics – S.Fartoukh ([Procedure](#))

Two MDs on flat optics are foreseen in MD2. The first block is devoted to a validation fill for performing different loss maps at different points in the squeeze and different crossing angle. Only one fill is foreseen in this first MD. Asynchronous beam dump is foreseen, but no off-momentum loss maps are presently foreseen. In principle there is time for an off-momentum loss-map in a second fill. The collimation team and rMPP will decide on clear guidelines for off-momentum loss maps for fills with first trains when qualifying new optics. Alessio also mentions that the number of pilots might be at the limit to complete all planned betatron loss-maps, which could be another motivation to plan for two fills. The assigned MD time for the first shift is 6+2 h, which should allow for two fills.

During the second MD, the number of trains should be reduced to initially use only 50 bunches in total, as also done for a first fill during a standard intensity ramp-up. In the second fill and if no problems are observed in the 50b fill, three trains (reaching some 150b in total) can be taken.

The details of the first fill with one train were presented, including the octupole polarity reversal and crossing angle reduction to 120 urad. Octupole scans are foreseen.

In the second fill, using three trains, a MQSX scan is foreseen, for lumi-optimisation and coupling correction.

Comments and recommendations:

- Foresee a second fill in the first MD block to allow for off-momentum loss-maps
- The COLL, ABT and rMPP teams agree that off-momentum loss-maps are highly desirable, but not a requirement to allow for first tests of new optics configurations (such as round, flat ATS optics) with short rains up to around 150b of total intensity during dedicated MD periods (typically limited to an MD shift). A fully validated optics with betatron loss-maps and asynch dumps remains a pre-requisite however for any intensity above the setup beam limit of $3e11$.

AOB

RAS.

Reported by J.Uythoven and M.Zerlauth

Week 30, 2018

Schedule status: DRAFT Last modifi

LHC	
0	Mon 23/7
1	Tue 24/7
2	Wed 25/7
3	Thu 26/7
4	Fri 27/7
5	Sat 28/7
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0	21:00 - 4:00 MD3295 Heat load measurements with a single circulating beam	Lumi: No Cryo: High
1	0:00 - 2:00 Ramp down	
2	2:00 - 9:00 MD2901 Asymmetric Collimator Settings in IR7	Lumi: No Cryo: Low
3	23:00 - 7:00 MD3270 Round ATS optics with large tele-index	Lumi: Yes Cryo: Low
4	18:00 - MD3583 LR beam-beam 2018 1:00 - 3:00 Ramp down	
5	22:00 - 6:00 MD2148 Flat optics	Lumi: Yes Cryo: Low
6	7:00 - 13:00 MD2148 Flat optics	Lumi: Yes Cryo: Low
7	9:00 - Recovery	
8	10:00 - 16:00 MD3603 DA with MD3623 uncorrected dipole b3	Lumi: No Cryo: Low
9	9:00 - 11:00 Ramp down	
10	10:00 - 16:00 MD3288 Instability latency with controlled noise	Lumi: No Cryo: Low
11	11:00 - 21:00 MD3284 Partially Strip Ions in LHC	Lumi: No Cryo: Low
12	13:00 - 15:00 Ramp down	
13	13:00 - 20:00 MD3327 Crystal collimation tests with proton beams	Lumi: No Cryo: Low
14	15:00 - 19:00 MD3349 Start collisions at Im Beta	Lumi: Yes Cryo: Low
15	16:00 - Recovery	
16	17:00 - 0:00 MD3263 LR beam-beam compensation using DC wires (2018)	Lumi: Yes Cryo: Low
17	16:00 - 18:00 Ramp down	
18	18:00 - 1:00 MD3583 LR beam-beam 2018	Lumi: Yes Cryo: Low
19	19:00 - 21:00 Ramp down	
20	21:00 - 23:00 Ramp down	
21	21:00 - 4:00 MD3295 Heat load measurements with a single circulating beam	Lumi: No Cryo: High
22	23:00 - MD3270 Round ATS optics with lag	
23		