(r)MPP meeting: Approval of Ion MDs for block#5 in November 2018 20/11/2018

Present: Markus Zerlauth, Jan Uythoven, Cristina Bahamondo, Christophe Wiesner, Daniel Wollmann Wolfgang Bartmann, Marco d'Andrea, Alessio Mereghetti, Daniele Mirarchi, Rogelio Thomas, John Jowett, Brian Petersen, Christophe Schwick, Anton Lechner, Michaela Schaumann, Arjan Verweij

The meeting aimed at a discussion and approval of the MDs foreseen during and at the end of the 2018 ion run. The slides presented are available on the following Indico site: https://indico.cern.ch/event/775146/, 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 (and presented in the rMPP meeting) have been included in the 'Comment' field of the ASM tool.

BFPP quench limit 2018 – C.Bahamondo (Slides)

Cristina introduced the proposed repetition of the BFPP quench test, recalling the initial test performed in 2015 with beam 2 impacting on MB.B11L5. Some discrepancies with FLUKA simulations and an aperture misalignment in this region made the interpretation of the results challenging and not fully conclusive.

For the 2018 test the magnet MB.B11R1 is proposed, using a standard physics fill and inverting the BFPP orbit bump from negative to positive to shift the maximum of losses into the dipole magnet, followed by a final reduction of the separation.

A constraint that was considered is the location of the QPS crates as they might be susceptible for SEU effects (which might result in the worst case in a false trigger and heater firing). Daniel reports that the QPS team has given their OK for the chosen location, a specific patch to allow for dedicated monitoring of the magnet has been installed in TS3. MP3 confirmed as well that no non-conformities are present in the magnets of MB.B11L1 and MB.B11R1.

Daniel mentions that in Sector 1-2, the training campaign to 7TeV is starting right after the MD. A quench in R1 would delay the training as Mirko was planning to end the physics fill directly with the first quench. John mentions that one change the location to L1 instead, however R1 is the preferred location as it is better simulated. The wish is to maintain both options open, in order to have a back-up option if the initial location would not quench.

The procedure foresees an increase of the BLM MFs to 1 for the magnets targeted to quench. The PC interlock has to be masked in order to allow the modification of the BFPP bumps in IR1.

As the positive sign of the BFPP bump has not been validated by loss maps, betatron loss maps will be included in the validation fill for the planned polarity inversion foreseen for 21/11/2018. In parallel this LM will serve as a reference set to assess the expected beam losses and he validity of the MF increase to 1 to be sufficient to allow for the magnet to quench. It is however not clear that the BLM signal is strong enough during a validation fill to find the optimum BFPP bump setting. The MD team will try to more accurately calculate the required value of the positive BFPP bump sign (last time optimum was +0.5 mm). It is proposed to take the loss map close to the value according to the calculated optimum value of the bump (the bumps are identical in L1 and R1).

Rogelio asked whether the quench test bears additional the risk of damaging the sextupole corrector circuits RCS, and possibly MCO. Daniel and Markus replied that the risk doesn't come directly from quenching but is believed to be more generally from a mechanical movement of the busbars (which also happens much more frequently during standard ramp), as the short circuits have been seen to appear

and disappear as a function of the current in the main dipole circuit. In additional we will experience many more quenches when training the machine to 7 TeV.

Decision: rMPP approves the execution of the test with the following clarifications/comments:

- Check during validation fill if master thresholds changes will be required.
- Decided to only perform the test in IP1, L or R, where loss maps will be made to validate the intended inversion of the BFPP bump. No tests in IP5 are foreseen. Loss maps are to be made independently on the 2 sides, i.e. with bump first on one side and then on the other side.
- Required time 4 – 6 hours (whereas 6 hours would allow for more margin for a second ramp if required)

Crystal collimation Test with Pb Ion Beams – D.Mirarchi (Slides)

Daniele recalled the encouraging results of improved cleaning performance using crystals on the proton beams, which is to be confirmed with Pb beams.

An initial low intensity fill (~with 30 bunches < 3e11 charges, scheduled for ~9h) will be used to optimize crystal collimation cleaning. Michaela mentioned that the proposed filling scheme with 3b is a beam that is currently not available from the injectors, instead the available batches of four bunches should be used. TCPs and TCSGs in IR7 will be opened and several sets of loss maps done.

Subject to a successful validation during the low-intensity fill, a second ramp with high intensity will take place. During the L3 ion source refill on 19/11/2018, an EoF study with 648 bunches took place (already with very low bunch intensity). 3oo4 crystals were kept in stable channeling for 2 – 3 hours. The fourth crystal will need to be set up again at injection as during a reboot it lost its position settings.

The high intensity fill is proposed to use 300 bunches, aiming at an insertion at flat top and in the following keeping them in channeling position during squeeze and bringing the beam at collision. No asynchronous dump was made at flat top with the crystal. The phase advance between MKD and crystal is known and is installed on the 'good' side of the beam in order for the crystal not be hit during an asynchronous dump.

Anton enquires whether any BLM threshold changes are required. This was investigated following the results from the EoF test and Alessio confirms that this does not seem to be required.

Decision: rMPP approves the execution of the test with the following clarifications/comments:

- Filling scheme needs to be corrected and confirmed with the injectors
- The high intensity fill is subject to a successful validation during the pow-intensity setup
- Assign 12 h, early next week. Tuesday starting 10 h +/- some hours.

Assessing Collimator Coating robustness with beam scraping – A.Mereghetti (Slides)

Alessio starts by referring to the HiRadMat tests of the TCSPM collimator previously performed. The MD merit is to find a safe limit for the alignment and knowledge of survival of the collimator coating in case of minimum beam life times.

The proposed element for the test is TCSPM.D4R7.B2, attempting the scraping of small portions of the beam at the time.

A detailed thermomechanical analysis still ongoing by EN/MME. Most likely the test will need trains, > 30 bunches, and the masking of collimator position interlock.

M. Taborelli has performed heating tests on samples, that did not reveal signs of coating pealing. The aim is therefore to remain below this maximum temperature of 400 deg during the test. A second test in

HiRadMat performed in air revealed some damage however, namely a scratching of the coating. As potential damage strongly depends on the power deposition as well as the time structure, the aim of the MD will be to assess the limits as well with circulating beams in scraping configuration. Daniel recalls that the lab tests in an oven are very different from tests with beam impact, as they provoke a faster and much more inhomogeneous energy deposition and therefore strong gradients of temperature and mechanical stress

An official statement for the approval of this test is still required from VSC. Giuseppe and Paolo should be re-contacted for this. Measurements are suggested to be done at FT, performing scraping and collimator alignment. Should be fine without use of the set-up beam flag: TCP can be moved further in (by opening further the inner limits) and alignment should have sufficient margin. Moving the TCP towards the beam should be done carefully so the showers will not trigger a BLM to dump.
BLM thresholds do most likely not to be changed, but this needs to be confirmed once the simulations are finished to allow the definition of the required beam intensities. The MD foresees a duration of **6 hours**, to allow for a second ramp. Only the lower jaw of the device (using B2) will be done.
After the test, an inspection of the device is foreseen either in situ or after removing it from the machine

Decision: rMPP is not yet in the position to approve this MD request as essential details and the approval of the VSC group are still missing. It was decided to organize a 2nd meeting in one week's time, with the presence (or a final statement) of EN/MM & VSC.
In case this MD cannot take place, partially stripped ions, crystal collimation or a shift of optics studies could be a potential back-up.

AOB

J. Jowett reported that an explanation for the observed luminosity imbalance has been observed. An imbalance in the skew quadrupoles MQSX3 in the triplets L2 and R2 was corrected by a new cross-coupling knob at the end of the long fill bridging the Linac3 source re-filling, which immediately recovered 70% of the 'missing' ALICE luminosity due to the restored beam shape and overlap. As this is a purely local correction, little to no effect was observed at other places around the machine.
The beams were however dumped once because of bad incorporation of this knob, it was then put manually for a subsequent fill which worked well, increasing the Alice levelling time from 4 to 7 hours. However, as the beam size in IR2 changed, the validation done in the current – even if non-ideal- setup (aperture scans and loss maps) are not fully valid anymore. The beam might be wider and rotated at the collimators as well as at other places, while collimator alignment was confirmed to be correct with the BPMs.
In view of the polarity change planned for the following day it was hence decided not to apply the knob for the time being, but to introduce and validate it fully during the polarity inversion.

Reported by J.Uythoven and M.Zerlauth