

21/11/2017

## **(r)MPP meeting: Approval of MDs for MD block#4 in 2017 - Part 2**

Present: J. Uythoven, M.Zerlauth, D.Wollmann, J.Wenninger, M. Solfaroli, H. Timko, J. Boyd, W. Hofle, C. Hessler, C. Wiesner, A. Lechner, S. Fartoukh, E.B. Holzer, B. Salvant, M. Valette

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

<https://indico.cern.ch/event/682316/>, whereas the final MD schedule can be found [here](#).

All MD procedures have been reviewed and minor comments and clarifications for those not classified as Type C (and presented in the rMPP meeting) can be found in a [Sharepoint File](#).

### **The actions and follow-ups from the previous meeting were quickly reviewed:**

- For the MDs on MKD waveform and asynchronous dump: Jorg and Delphine have written a small procedure on how and which elements need to be masked (injection sequencer, BQM check in SIS) to allow for injecting into the abort gap.
- M.Schenk has clarified the requested structure and amplitude of the orbit bumps in MD2190 in collaboration with Jorg - <https://edms.cern.ch/ui/file/1870895/1/MD2190.pdf>
- For the 16L2 MD the following intensity limits apply
  - For 8b4e BCS: there is no particular limit up to what was already used this year (i.e. up to 1.3e11 p/b). For information, the last fill was at 1.3e11 p/b with 1868 bunches.
  - For 25 ns, it is recommended keeping the same total intensity as in potential previous fill (i.e. 2200 bunches at 1.1e11 p/b could be ok for the first attempt).
  - The following fillings-schemes are finally proposed
    - 25ns\_2460b\_2448\_2052\_2154\_144bpi\_19inj
    - 25ns\_1868b\_1866\_1089\_1749\_128bpi\_17i8b4e
    - 25ns\_1548b\_1536\_1396\_1456\_96bpi\_17inj (in the unlikely case 16L2 event cannot be triggered with 8b4e)
- The Collimation team agrees that a complete set of off-momentum loss-maps is not a prerequisite to inject trains for the ATS MD, but endorses to end the first fill with the LM off-momentum in one sign
- The MD for amplitude detuning will use maximum collimator openings of 10 sigma to assure a minimum protection of the aperture during the measurements.

### **MD 2930 - Asynchronous beam dump test with bunched beam (C. Wiesner) - [Slides](#)**

- Injection into the abort gap is required for this MD. Masking of the different interlocks in injection sequencer, SIS etc. was detailed and checked by Jorg, ref. [5] of the procedures. Jorg explained that the SPS BQM will not be masked but it is rather the BQM check in the SIS.
- Validate of first bucket to hit the TCDQ to be tested with pilots at injection. Mask post mortem to gain time at injection? Markus proposes to mask the injection interlock in the SIS and NOT mask the Post Mortem. Like this the data will be present and can be signed off later. First validation will be done with pilots.

- Then trains of 48 bunches at injection energy. Test with  $6 \times 10^{10}$  p+/bunch and in a second step with  $1.25 \times 10^{11}$  p+/bunch. Intensity reduction proposed to be done in the SPS. With  $1.25 \times 10^{11}$ , no quench expected at injection according to Anton, but BLM signals are likely to saturate. First test without bump, then orbit bump of 2 mm, which is also the max allowed interlock level which is applied during standard asynchronous dump tests. Perform with  $1.25 \times 10^{11}$  p+/bunch for each beam separately.
- Following a question from Wolfgang H.: this is the worst position one can inject for the machine – so any error in the filling scheme would be less critical for the machine.
- The reason / justification was briefly discussed following questions by Stephane, including that it is not expected to be very dependent on the optics (which changed wrt to the 2016 asynchronous dump test where the magnet quenches were observed).
- High energy test at 6.5 TeV: benchmarks for intensity of  $3.2 \times 10^{10}$  p+ hitting the TCDQ. Exercise with one pilot, no orbit bump at flat top, perform with pilot of  $1 \times 10^{10}$  p+. Following FLUKA simulations one should increase the bunch intensity up to a maximum of  $3 \times 10^{10}$ , but this is very difficult for the BPM resolution range – best to achieve higher intensities is to inject a weak INDIV of  $\sim 5 \times 10^{10}$  and scrape it down. This would risk however to provoke an asynchronous dump (as beam is already in the AG) at higher bunch intensity, as any fault occurring before the scraping would trigger an asynchronous dump. Propose to use fat probe of  $2 \times 10^{10}$  p+ max, no scraping down of higher intensities in this MD. However, the test can be repeated with shifted bucket.
- This is the last MD – therefore all masks and parameter changes have to be rolled back. Validation with beam will be done at start-up 2018.
- Daniel mentions that a MP3 person should be on shift (Daniel), in case of quench.
- Jamie: ATLAS would like to take cosmics during this time. It will be better to switch off all experiments before the MKD scan and the asynch dump test.
- It might be good to do a standard debunched asynch test at injection at the start of the MD for comparison.

#### **MD 2269 - Round Telescopic optics - revalidation and LRBB studies with trains (S.Fartoukh) – Slides**

- Optics with large telescope – beta beating – in the arcs. First part of the MD will be devoted to the (re-)validation of the configuration established in previous MDs and loss maps. The different beam processes used to reach the squeezed phase are detailed. Difference with MD3 are new TCT functions based on measurements.
- First fill to be done with 2 nominals and 10 probes, first set of loss maps with 170 urad crossing angle, then again with minimum Xing angle of 100 urad. Finish with aperture measurements after scraping down remaining beam to 1 – 2 pilots. No full set of off-momentum loss maps required  
**Action:** Verify with Stefano / Roderik if this is OK. Is the triplet aperture measurement obligatory? -> Final recommendation is to do single sign off-momentum loss-map before aperture measurement.
- Second fill for full cycle with asynchronous beam dump in the end, crossing angle of 170 urad.
- Next fill with trains, in second half of the MD. With two trains of 48 bunches and 1 train of 8b4e – for a total of 165 bunches. Full cycle with  $MO > 0$ , scanning octupoles with both polarities, with and without collisions, while varying the crossing angle and possibly the working point (flipped tune crossing the diagonal, slightly risky).
- Little contingency in time for both parts of the MD – only the 2 hours between the MDs.

#### **MD 1828 - Beam scraping in case of non-working dump-trigger (M.Valette) - Slide**

- Follow-up of first tests at injection which successfully demonstrated achieving life-times of 30 min using ADT blow-up.
- Anton: 200 kW threshold is only valid for durations up to 10 seconds, the limit is lower for continuous losses in RS12, namely  $\sim 40$  kW.
- The current MD is only to be understood as a proof of concept, before this is to be operationally operation used the shift crews need to be trained or the procedure fully automated – this will be discussed later. Expect to dump on BLMs between 40 and 80 kW. Expected losses for the 600 bunch scraping is  $\sim 40$  kW. However, one can extrapolate losses relative to dump threshold from prior scraping with lower number of bunches during the MD.
- Propose to take beam as end-of-fill of the RF MD – 25 ns 600 bunches. First, scrape on Beam1 12b, then scrape 48 b and finally 400 bunches aiming at 30 minutes life time and stop at  $5 \times 10^{10}$  p+/b (due to BPM intensity range). B2 scrape 600 bunches with 30 minutes life time, wait until dumped by non-physical orbit readings. Always check on BLM limits and scale for following tests. Markus asks Anton to check if there are any BLM bottlenecks, e.g. in cold elements around IR7; this should however be fine as the BLM setup has been set-up scaling from loss-maps and operations.
- Procedure to be updated for the proposed programme.

#### **MD 2889/2935 - 16L2: UFO events and solenoid studies (M.Valette) - Slides**

- The use of 600 bunches 25 ns affects the RF MD and the beam scraping MD mentioned above. Going to 25 ns is less critical for heating. Check on this off-line how this affects the RF MD. The RF confirmed after the meeting that their wish is rather for higher bunch intensity than for a large number of bunches. Too high total intensity might risk triggering 16L2 events at flat-top during the RF MD already, which could degrade the availability of the MDs.
- Aim in this MD is to trigger the 16L2 UFO events, first at injection and ultimately during a ramp by using 25 ns bunches, many bunches and changing solenoid and corrector magnet settings.
- 2460 bunches at injection, 1.3 p+/b, blow-up 196 bunches per plane to increase the diagnostic of UFO origin and trajectory. Magnet correctors can only be changed by 50 mA at injection due to the larger kick (interlocked in SIS), at flat top a few A are possible.
- Ramp with 1500 bunches to 6.5 TeV, same filling scheme and blown up bunches in both planes. Blown up bunches in families of 48 b to have them in each quarter of the machine to track any motion with dBLMs.
- To be performed on both beams. Barbara will present this afternoon an estimation of the required signals to see something on the dBLMs at injection.

All MD procedures presented in the past 2 rMPP meetings have been [circulated in EDMS](#) for final approval by Friday 23/11. Taking into account all comments and follow-ups mentioned above, all MDs for MD block 4 are approved by rMPP.

#### **AOB**

Anton enquired whether the reverting of the BLM flat top corrections at 2.5 TeV are needed. It was agreed to leave them in until the end of the physics run and discuss in a future MPP an appropriate moment for their removal.

Reported by J.Uythoven and M.Zerlauth