

07/11/2017

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

Present: J. Uythoven, M.Zerlauth, D.Wollmann, R. Bruce, J.Wenninger, C. Wiesner, C. Schwick, X. Buffat, M. Schenk, E.B. Holzer, C. Bracco, Belena Salvachua, V.Kain, M. Frasier

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/678569/>

M.Zerlauth briefly introduced the meeting and recalled the latest change of planning, combining the previous MD block #4 and #5 in a common block at the end of the 2017 physics run. Jan clarified that the final MD plan is still being worked out, the final schedule can now be found [here](#). A second rMPP will be organised for the remaining MDs classified as type C which cannot be discussed today.

#### **Dyanmic extraction bump in LSS2 (M.A. Frasier) - [Slides](#)**

- Motivated to reduce the losses on the ZS wire during slow extraction on the SFTPRO user. The aim is to move the beam over the ZS wires, via a so called dynamic bump, to correct for the movement of the separatrix arm. Expect reduction of losses by 6 %.
- ZS damage limit estimated to be  $1.9 \times 10^{12}$  protons, for a speed of 0.7 m/s, estimate dates back to the 90's.
- Mitigations: very low intensity beam for tests of  $2 \times 10^{11}$  ppp and also checked the BLM reaction time.
- Bump consists of orthogonal X and PX knobs, superimposed onto the extraction bumps. The behaviour of the beam has been checked. Closure of the knobs was checked with beam during a first test performed on 4<sup>th</sup> October. Checked as well tune shift, which can be compensated. All with 50 % bump amplitude.
- Procedure for tomorrow:
  - Validate knobs without beam. Higher beam intensities than  $3 \times 10^{11}$  p+ when ZS is out. Safe time for not having to shave intensity.
  - With intensities below  $3 \times 10^{11}$  when ZS is in – expect about 10 % of estimated damage limit. Repeat tests of October with 100 % bump amplitude.
  - Insert ZS, reduce the LSS2 BLM thresholds, apply orthogonal knobs. Record losses, beam sizes as function of the knobs.
- Answers to comments from Markus – see slide.
  - It is not foreseen to make it operational right now.
  - Aim of MD is to see how bad it gets if dynamic bump is NOT applied properly. No limits on k-value as one wants to probe the 'wrong' combination of knobs.
- About 10 - 20 BLMs on which limits will be adjusted for the MD. Propose to globally scale the normal limits.

- Looking at installation of faster LHC BLM(s) for next year.
- Looks all necessary steps have been taken to assure protection for tomorrow's high intensity test, but the proposal is not yet ready nor approved for standard operation.

#### **MKD rise time (C. Wiesner) - [Slides](#)**

- MD should be easier than previously, as the variable AGK can be used. No tunnel access required.
- Use of single pilots at injection and measure position at BTVSE as function of the bucket number.
- Critical part is the change of the AGK – procedure for this soon to be published. SIS to be masked and SPS BQM to be masked as well (Jorg).
- Jorg mentions as well that the Injection Sequencer will need a new software release to allow the injection. To be verified with Delphine and be sure to put it back. ABT to check with Delphine.
- Also, MKI entry to be injection BIS to be masked as it includes the AGK.
- Measure both beams
- Markus: How are we protected against injecting higher intensity beams? Protected by procedure and responsibility of the ABT team and EIC.
- Action: Revalidation check of the AGK in there → **need to check that during checking of the AGK also the SIS and injection sequencer interlock again. Procedure to update.**

#### **BTF and Landau Damping – (X.Buffat et al) - [Slides](#)**

- Test hardware improvements at injection. Introduce linear coupling by using existing knobs.
- Second fill needs crossing angle scan with one safe beam and one unsafe beam. Apply procedure to use sequence to open the threshold, only then use application which changes crossing angle and TCT and TCL settings. Centre to be checked by BPMs.
- Table is going down to 60 urad, not sure that we will go that far. Have one nominal bunch. Plan is not in collision, but separated. One will be going in steps of 5 urad, not colliding.
- Will we be stopped by orbit or pc interlocks? Pc interlocks to be checked. Watch when warning comes in (at 70 %) then decide to mask if following steps remain small.
- Roderik: will normally be safer with smaller crossing, go away from cold mass. On top: TCT BPM interlock will be active – guarantee the good alignment.
- Action: **It was agreed that an updated procedure will be circulated, addressing the aforementioned questions.**

#### **Single bunch instability threshold – (X.Buffat et al) - [Slides](#)**

- Single nominal per beam, through cycle. Symmetrise TCTs and go to flat orbit, only TCTs to coarse settings.
- Reduce octupole, crossing angles back per IP / flatten etc.

## Q'' stabilisation during injection – (M.Schenk et al) - [Slides](#)

- MD on Q'' done in Oct 2016 with single bunches at flat top.
- Since then: new Q'' knob for new optics, at injection energy, using quite strong sextupole settings.
- Large beta-beat (up to 20 %) and coupling have already been measured with these knobs. Use orbit bumps to reduce beating, skew quad knobs for coupling.
- Jorg: Was the dynamic aperture measured with these sextupoles? No.
- Do we need a full machine? The answer was no. OK for 600 – 800 bunches at injection. 25 ns BCMS 144 bpi as for scrubbing. Not 8b4e. Might we have a problem with MKI length and AGK? Presently set to 196 25 ns slot: OK.
- Interlocking on bumps is 2 mm – if stay within 2 mm, should be OK. Information on pi-bumps missing... Revalidation after bumps of beta-beating
  - Jorg would like to have some more details on bumps and orbit, to be clarified.  
**Action to check in rMPP in two weeks: know max amplitude.**
- Loss maps to be done, only B1 in H and V and off-momentum plus asynch dump check (all at injection). Analysis to be done off-line
  - **Recommendation: MD to be split in two, 2 x 4 hours.** Two or three days in between, good for many reasons: loss maps and check on actual orbits.
- No radiation issue.
- Intensity ramp up at injection? A filling scheme with first 3 trains of 72 bunches and then up to 1000 bunches max with 144 bunches.

## AOB

All procedures will be circulated via EDMS for final approval, a second rMPP meeting will take place on 21/11 to approve the remaining procedures of the now combined MD block #4.

Reported by J.Uythoven and M.Zerlauth