

Minutes of the HSC section

115th meeting on Monday 14/08/2017 (10:30, 6/R-012)

Present: See <https://docs.google.com/spreadsheets/d/1fZiu3vtf546odhd2ONxtW0mx9p8cV-fURT9Kxi7QCys/edit#gid=0>

1) Newcomers / visitors

- None.

2) Comments on the minutes of the previous 114th meeting + Actions

- **Action EleonoraB:** Produce a single plot with the 2 TMCI curves (i.e. without and with longitudinal wake) superimposed.

3) General infos and follow-up (EliasM)

- SLM:

- Last two LMC meetings dedicated to 16L2 to a great extent.

- A temporary fix was fortunately found (MCB.16L2 corrector powered with some A and removed from the OFB) but the mechanism has not been identified yet.

- Next step for us: put together e-cloud and ions simulations. Aaction plan to be defined: **Action GiovanniR and EliasM.**

- Reminder from GA: 16 is the place where we do the primary vacuum, and when we pump the 2 beams are connected (which could explain why some observations were done with B1 and some with B2)...

- The second major potential issue in the LHC performance is the transverse emittance growth (in particular at injection and during the ramp). Some discussions organized with YannisP and some optimizations (tunes, chroma and octupoles) made. Detailed analysis on-going with in particular all the transverse coherent activity observations by LeeC (see below) => To be discussed also soon at the LBOC (and before with the different experts).

- See the slides which have been discussed during the meeting organized by YannisP and EliasM on 08/08/2017

- <https://indico.cern.ch/event/658828/#preview:2345543>

- <https://indico.cern.ch/event/658828/contributions/2686214/attachments/1505299/2345501/injectionActivity.pdf>

- <https://cernbox.cern.ch/index.php/s/EO7yGe75nunvsQD#pdfviewer>

- Next LMC talks from us

- E-cloud on 30/08.
- BGI impedance aspects => Still to be scheduled: Aim for beginning of September? **Action BenoitS and OlavB.**

- LHC => Peak lumi on TH of $\sim 1.75E34$ (due to higher bunch intensity: $\sim 1.25E11$ at injection).

- XavierB looked at a high latency instability at flat top with 300 bunches (fill 6068): https://indico.cern.ch/event/658828/contributions/2686214/attachments/1505299/2350278/2017-08-12_flatTopInstability.pdf

- Some individual bunches became unstable (B1H) after 20 minutes at flat top

- Different bunches started oscillating at different time according to the HT monitor

- Similar to fill 5664 at the beginning of the year

=> According to the Head-Tail monitor, the intra-bunch pattern is compatible with what we would expect from impedance. It seems we observe a loss of Landau damping (as observed with linear coupling). What is the cause now? First check linear coupling.

- XavierB also made movies with the new ADT activity monitor of the recent coherent instabilities linked to 16L2 beam dumps in the ramp: 6063, 6064, 6065, 6066 => https://indico.cern.ch/event/618858/contributions/2690028/attachments/1507794/2349955/2017-08-11_16L2dumpsRamp.pdf

4) 16L2 dumps: dBLMs vs ADT (Arkadiusz Gorzawski):
https://indico.cern.ch/event/658828/contributions/2687996/attachments/1507886/2350737/dBLMs_16L2_LBOC_-_Copy.pdf

- 6 cases where it was possible to record the dBLMs => Can see the bunch-by-bunch pattern of the losses. 5984 is the perfect fill to analyse as we have both dBLM and ADT and it was the fill before the fix with the corrector. 6073 is the quench from Saturday. Still under analysis and ADT should be available.

- Summary: analyses started but no clear results yet.

- Not easy to match PM/ADT to dB LM => Not only the possible synchronization error, but shape and position of the losses.

- Is it finally due to some intrinsic limitations from the dB LMs or do we need more time for the detailed analysis? **Action ArekG**.

- Next:

- It does not seem that we have enough material for the coming LMC => Talk to be postponed for next week.

- Look in particular to what happened during the week-end: 2 cases + a quench.

- Reminder about the 2 modes for dB LMs: histogram (every second update only) and the raw data as presented today.

- Comment from GianniI: it seems we don't see anymore the steady state losses after TH, when the BS flushing was done. StefanoR mentioned that we did not reach the highest intensity yet... To be followed up.

5) Magnetron effect in the LHC (FritzC):

<https://indico.cern.ch/event/658828/contributions/2689938/attachments/1507857/2350102/Interactionsofmicrowavesandelectroncloudsfinal-FZFC.pptx>

and <https://indico.cern.ch/event/658828/contributions/2689938/attachments/1507857/2350103/go>

- 3 ingredients for the magnetron effect to occur: e-cloud (28 GHz/T is the cyclotron resonance in a dipole), a resonance (e.g. HOM) and sufficient high acceleration voltage. There are 2 regimes: incoherent and coherent about a certain acceleration voltage.

- Earth is surrounded by ecloud, which is the ionosphere.

- Past set-up: excite a wave-guide mode and send a microwave inside an e-cloud => The idea was to measure the integrated e-cloud over a certain length.

- Could this magnetron effect plays some role in the 16L2 issues? Discussions ongoing => Would be useful to have some estimates (via simulations) of the onset of the magnetron effect, i.e. when the faint (since incoherent) emission from the electrons (spiralling up and down in the string B-field of the bending magnets) flips over to the violent coherent mode.

6) Update on LHC coherent activity at injection (LeeC):

https://indico.cern.ch/event/658828/contributions/2687995/attachments/1507882/2350735/coherentEffectsatInjection_LRC_14-08-17.pdf

- Summary

- Clear noise lines in ADTObsBox (also seen in BBQ).

- ADT will try to kick at this frequency, which could cause emittance blowup.

- Moving the tunes around may help, increasing H by $5e-3$ (from 0.27 to 0.275) could make a difference => To be tested.
- The other subjects already discussed are ongoing: injection cleaning touching some bunches (with ADT experts) and MKI touching some bunches (with MKI experts).
- Comment from FritzC about the effect of UPS (not covered by the EU EMI as they just stay below 9 kHz) => Check for lines of harmonics of 8.5 kHz (tbc).
- As concerns the beam-beam coupling during injection oscillations, XavierB performed some first COMBI simulations (including all BBLR in 1 IP at 15 sigmas, $Q' = 15$, $I_{oct} = 34$ A) for different ADT gains => The transmission of the oscillations to the other beam is total without ADT (or very low gain) and negligible for operational gain (~ 10 turns). It is partial for a gain of 50 turns. The associated emittance growth due to decoherence follows the same trend.
 - What happens in the presence of impedance, e-cloud, etc.? **Action XavierB.**
 - It might be wise to try and minimize the beam-beam coupling => Should we increase the Xing angle and/or the parallel separation? **Action XavierB.**
- The orbit effect at injection (~ 0.4 sigma oscillation) is predicted to have a negligible effect of the transverse emittance growth, even for intermediate (~ 50 turns) ADT gains. What about HL-LHC? **Action XavierB.**

7) Progress/status in the different activities/projects and reports from meetings and in particular the issues/successes in the different machines (Everybody)

- Nothing special to report.

8) Miscellaneous

- The next (116th) meeting will take place on Monday 21/08/2017 (in room 6/R-012 at 10:30)
=> Current agenda:

- 1) General info and follow-up (EliasM)
- 2) Discussion about the plan for next LHC MD block (Everybody)
- 3) Low-impedance collimators for HL-LHC (SergeyAntipov)
- 4) Progress/status in the different activities/projects, reports from meetings and in particular the issues/successes in the different machines (Everybody)

- Important events and dates for HSC: <https://espace.cern.ch/be-dep/ABP/HSC/SitePages/EventsAndDates.aspx>.
- Web site: <https://espace.cern.ch/be-dep/ABP/HSC/default.aspx>.

Minutes by E. Metral, 17/08/2017.