

Minutes of the HSC section

127th meeting on Monday 20/11/2017 (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 126th meeting + Actions

- **Action ArekG:** Is the issue with dBLMs vs ADT due to some intrinsic limitations from the dBLMs or do we need just more time for the detailed analysis? => Some limitations solved and analysis still ongoing. Might need to postpone the LMC talk.

- It is followed-up by MassimoG.

- Reminder: It is important to know which bunches are losing and we hope we will be able to correlate the ADT and dBLM data.

- Info from BenoitS on FR 08/09/17: FBCT post-mortem data (100 turns total with ~3 turns after dump) now available to see which bunches are losing (in complement)
=> Let's see what it will give at the next 16L2 dumps.

=> No news.

- **Actions XavierB:**

- What happens to the injection oscillations in the presence of beam-beam, impedance, e-cloud, etc.? => It might be wise to try and minimize the beam-beam coupling, which is mainly due to the BBLR, i.e. we should increase the Xing angle (but the effect goes linearly with the BBLR distance).

- Check the different roles of IP1 and/or 5, or 2 and/or 8? Similar for all of the them due to the linear dependence.

- Effect of polarity? Probably it has an impact...

- Effect of the parallel separation? It is small compared to the one of the crossing angle.

- 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?

=> No news.

- HL-LHC at ultimate energy of 7.5 TeV => Some actions from us by the end of September => **New deadline to be defined**

- StefanoR should send us the settings for collimators asap => DanielM sent the info on 20/10/2017 for $\beta^* = 15$ cm. For the 46 cm (be careful as the new baseline is 40 cm!) it should come soon.

- Then we should assess the impact on beam stability (Action: SergeyAnt, AdrianO, AnnalisaR)

- Impact of higher energy on beam stability for proposed collimator settings.

- Assuming sextupoles and octupoles being able to operate to 600 A, assuming constant kick voltage from the damper.

- Electron cloud driven instabilities => Impact of higher energy => Info already sent to EliasM by GianniI.

- Any intensity (number of bunches or bunch population) limitation?

- E-cloud and synchrotron radiation effects => Action GianluigiA, GiovanniR and GianniI => Info already sent to GianluigiA by GianniI and GiovanniR.

=> **DEADLINE: 24/11/2017.**

- Actions from last WP2 meeting => Action NicolòB and SergeyAnt

- "... This needs to be done in any case for the high frequency HOMs which are present also with longitudinal RF fingers installed".

- "Gianluigi proposes to identify one or two critical HOMs close to delicate components to be provided for a thermo-mechanical analysis to assess heating and outgassing".

- "Chiara asks if issues could appear also in the transitions next to the TDI. This is confirmed by Elias and Nicolò. Evaluate the impact of the transitions".

- "Elias adds that at some point stability studies need to be performed in addition of heating studies".

=> Was said that it will be for end November.

- Long-term upgrade/replacement of TRAIN => To be finalized with YannisP and XavierB by end September (**Action EliasM, YannisP and XavierB**).

=> News from XavierB:

- We have the order of magnitude and someone to work on it.

- RamaC has some info as concerns the CCs. And we could work on the phase advances to mitigate possible issues if needed (by November we would be able to state if it works).

- aC coating of HL-LHC: What would be the effect on beam stability and TMCI? **Action NicoloB and SergeyAnt**.

- Reminder from Giovannis: If the sectors would be as the good one, then we would not need to coat.

- If fact LHC could be coated $\sim 1/2$ or $\sim 1/3$.

- Might be good to review the effect for the SPS.

=> News from BenoitS (from a recent talk from TE-TM): The temperature of the new a-C coated shielded beam screens in Points 1 and 5 will be higher than the usual 5-20 K: 60-80 K is currently contemplated.

- HE-LHC impedance model: after discussion with FrankZ, the goal would be to have a first model by mid October (**Action BenoitS**).

- Invitation to write an ICFA BD NL article.

=> Ongoing.

- Low-impedance HL-LHC collimators (**Action SergeyAnt**): only show the delta in Ioct (for a certain chromaticity and ADT gain) for the different cases (and the different contributions to the impedance model) compared. It might be good to have this info both on plots and in tables. We should also put ourselves in the most critical case, i.e. assume the transverse emittance that we have at injection (as the blow-up might not occur at injection) => Update the plots etc. using the emittance at injection, i.e. 2.0 for the nominal HL-LHC and 1.7 for the BCMS beam.

- Also update the plots with the measured Mo resistivity and then the results could be presented at a WP2 meeting => **Planned for 31/10/17 (already partly discussed at the last ABP info group meeting)**.

- Action from last WP2 meeting (Themis, Riccardo and Elias)

- The CC feedback system appears to be effective in fighting the emittance growth due to CC noise; however there are additional points to be addressed:

- Pick up location and achievable beta function.
- Interplay with the ADT, especially in the presence of impedance.

=> No news.

- Others?

- Update of HL-LHC OP scenario => Updated version sent to co-authors: please have a look and send me any other useful info.

- I have few comments/references to implement. Others? Deadline today.

- As concerns the parameters for the 8b+4e, we decided that it will be discussed in another note.

3) General infos and follow-up (EliasM)

- HiLumi meeting in Madrid last week => Highlights and actions:

- Heat load: find the filling patterns (8b+4e and 25 ns) such that we are at the limit (and not above) with the cooling capacity.

- What is the best filling scheme?

- MD to be planned with BBLR and LOF < 0.

- Meeting on Friday with RamaC et al. on Crab Cavities

- Beam-induced RF heating to be checked for back-up scenarios (8b+4e in particular) => FrancescoG and BenoitS.

- As concerns the transverse modes, we stressed that the associated coupled-bunch instability CAN be damped NEITHER by chromaticity NOR transverse damper (as SergeyAnt carefully checked) => This means that only the Landau octupoles remain and since the beginning of the LHC, the octupoles current is close to the maximum and we might lose Landau damping => Over the years, we identified already several mechanisms which can considerably increase the required Landau octupoles current and lead to a loss of Landau damping...

1) Cutting the tail of the transverse profile

2) Interplay between BBLR and Landau octupoles during the squeeze

3) Linear coupling

4) E-cloud

5) Destabilising effect of the transverse damper and longitudinal distribution close to $Q' \sim 0$

6) Skew octupolar errors

=> What will be the others? As at the moment we don't understand some issues we have with both the single bunches and the trains...

Loss of Landau damping is a big issue => In the longitudinal plane, this loss of Landau damping obliged the RF team to increase the bunch length from 1 to 1.2 ns...

In transverse, we have to be extremely careful if we don't want to increase the transverse emittance or reduce the bunch intensity, with a direct huge impact on luminosity => **So we stick to the ~ 1 MOhm/m limit as our request.**

- High-beta run at injection energy has been cancelled => Background conditions were much too high for physics.

- News from LHC and 16L2?

- Fill with 1292b, first fill surviving the Grufalo storm, new record fill length of 37h 10' (with some help by SPS RF).

- Over the week-end: 99.7% availability and 95.2% in stable beams.

- 2.51 TeV run status: Following the Grufalo storm last week (7 dumps), the bunch intensity was lowered to $1E11$ ppb and the number of bunches to 1292 and later 1548.

- MD4 planning => Everything seems under control. As concerns the ATS MD, discussions with Stéphane on what could be studied from beam stability point of view => To be discussed also at the next WP2 meeting.

- SLM:

- GA reported some discussions about LHCb VELO and difficulty to perform some measurements => To be followed up by BenoitS.

- Reminder (email sent) for VIA 2018 - Projects collection: For the 2018 VIA exercise, the BE Department has been granted 5 VIA slots. Supervisors have until 17 November 2017 to create a project on FAS projects web-site. Once submitted, the projects will be selected/approved by PaulC.

- Impedance lab

- Impedance Lab Logbook to be put in place to avoid disappearance of some material

=> Started already by NicolòB.

- Francesco di Lorenzo could be the responsible of it and Lab (discussed with AlessandraL).

- Action for us for last CollUSM: Let's assume we have 1 (only 1, the most exposed => TCSG.D4) collimator in CFC with 5 microm of coating of Mo and let's assume that 1 stripe of say 3 mm width of Mo is missing in one of the jaws (exactly at the position of the beam) => what would be the effect? Or more generally, if we scan the width when does this start to become critical? Let's do this when we can, no deadline for the moment...

- ABP-CWG meeting

- AlessioM on HT-CONDOR.

- CNAF issue.

- HPC clusters set up at CERN => Will be discussed on Thursday.

- SPS: Replacement of three extraction kicker magnets (MKE6) in LSS6 during YETS 2017-2018.

- FCC-hh week => What could we present?

- TSC: deadline to send me your requests.

- Stability diagrams => After several discussions, I will also call them "Vaccaro diagrams".

- ABP info meeting on Thursday => DavidA on DELPHIT improvements and LHC TMCI.

4) Follow-up of actions (Everybody)

- First MD plans for 2018 to be sent to RogelioT et al. by Dec. 6:

- Interplay between the BBLR and LOF < 0.

- Some slides from XavierB:
https://indico.cern.ch/event/677919/contributions/2776188/attachments/1561064/2458013/2017-11-20_2018MDs.pdf

- Other propositions from BenoitS: $Q' < 0$.

- RogelioT proposed to measure a tune for ~ 1 h => To be done in other MDs.

- Ecloud MDs => High-intensity with $8b+4e$ full beam.

- Update on CC's beam induced heating by FrancescoG:
https://indico.cern.ch/event/677919/contributions/2776188/attachments/1561064/2458166/Update_on_Crab_Cavity_beam_induced_heating.pdf.

- Updated slides and the message is that it should be fine => To be sent to RamaC.

- 16L2 events during week 46 (7 dumps!) by DavidA:
https://indico.cern.ch/event/677919/contributions/2776188/attachments/1561064/2458391/2017-11-17_16L2specialRuns_augmented_v2.pdf.

- Slide 11: nice positive tune shift along batch of $\sim 1-2E-2$!

- GianniI and LottaM looked at the temperature in the Beam Screens during the dumps and everything looked as before.

- To be discussed also during tomorrow's LBOC and at the LMC on Wednesday.

5) Effects of the LHC 16L2 solenoid (GianniI)

- Postponed to next week.

6) SPS TMC1 with the Q22 optics (KevinL)

- Postponed to next week.

7) New research strongly indicates the elimination of transverse beam impedance by making beam equipment in the shape of higher order multipoles (OlavB): ?

- OlavB showed the progress made, answering to some questions but still some others remain to be answered.

- Next: Start to discuss with our collimation friends to check the constraints from their side (such as the required minimum width and height of the jaws; how the jaws should move; etc.).

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

- ATS-IWG (BenoitS)

- Not discussed.
- HSC-IWG (NicoloB)
 - Not discussed.
- Ecloud (GianniI)
 - Not discussed.
- Beam-beam (XavierB)
 - Not discussed.
- Space charge (AdrianO)
 - Not discussed.
- ABP-CWG (GiovanniR)
 - Not discussed.
- PyHEADTAIL (KevinL)
 - Not discussed.
- DELPHI (DavidA)
 - Not discussed.
- NHTVS (SergeyAntipov)
 - Not discussed.
- LIU (GiovanniR)
 - Not discussed.
- HL-LHC
 - TCC:
 - Not discussed.
 - WP2:
 - Not discussed.
- FCC

- Not discussed.
- PBC (GiovanniR)
 - Not discussed.
- Machines
 - Not discussed.
- MDs (past and future)
 - Not discussed.

9) Miscellaneous

- The next (128th) meeting will take place on Monday 27/11/2017 (in room 6/R-012 at 10:30)
=> Current agenda:

- 1) General info and follow-up (EliasM)
- 2) Follow-up of actions (see past minutes) (Everybody)
- 3) SPS TMCI with the Q22 optics (KevinL)
- 4) Simulation studies for the LHC 16L2 solenoid (GianniI)
- 5) General discussion about the 16L2 instabilities (Everybody)
- 6) Progress/status in the different activities/projects, reports from meetings and in particular 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, 27/11/2017.