Minutes of the HSC section

128th meeting on Monday 27/11/2017 (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 127th 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.

=> DONE: SergeyAnt wrote a note that he sent to GianluigiA.

- Actions from last WP2 meeting => Action NicoloB 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 Nicolo. 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 ~ ½ or ~ 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 => Still some comments and references coming.

3) General infos and follow-up (EliasM)

- LHC 08:30 meeting => Nothing special and this week is the MD4 week.

- Xmas party:

- Please answer to AlessiaV to confirm or not => Deadline: This Wednesday 29/11/12 at 12:00.

- Please contact AlessiaV to help to prepare the room => Most of us should help as we are doing this altogether.

- Do you want some special dishes etc.? We said that we could bring some Lebanese dishes. Any other ideas welcome!

- Ski outing day together: let's reserve Sunday 20/01/2018!

- 2018 MERIT exercise: interviews being planned .

- SLM:

- Donna Carmona will be leaving by the end of the year. New HR representative not yet nominated.

- MERIT timetable details not fixed yet. Preliminary dates: all interviews should be done by 28 February, GL signature by March 6th.

- CCP (Standing Concertation Committee) may suggest to take away the fixed-percentage distribution of people in the different categories (Unsatisfactory, partially satisfactory, etc.), still the overall budget limit stays fixed.

- The alumni program is open: Sign in!

- A decision on the request by Lucio Rossi to extend the SPS shut-down by 1 week to make sure that the crab cavities are installed has been postponed to the time of the

Chamonix meeting, when the situation can be better assessed.

- Ronny Billen said that the present inventory will be simplified and an intangible assets inventory will be updated – for that group contacts will be contacted.

- PBC workshop last week => Talk from EiriniK: Complex performance post LHC Injectors Upgrade (LIU).

- Question from RoderiKB to impedance team: "…From the discussions 1 year ago (https://indico.cern.ch/event/585875/contributions/2360017/attachments/1367108/2071469/review-margins-2016-2017_NB.pdf), I understood that going to a 1 sigma retraction TCP-TCSG did not present any showstopper from impedance. Do you think this is still the case, or has there been any new findings during the year? Just to be fully clear, the settings we are (possibly) considering are to keep the TCP at 5 sigma as this year, but to move in the TCSGs from 6.5 to 6 sigma…" => Answer from / action for us.

- Update from FrancescoG and BenoitS for the beam-induced RF heating with CC: https://indico.cern.ch/event/680365/contributions/2787279/attachments/1561298/2466230/Update_on_crab_cavities_heating_with_HL_fills.pptx => Slides to be sent to RamaC.

- Lunch to 1) celebrate Xmas together and 2) thank KevinL for all the past years with us and wish him a lot of success with OP => Would Wednesday 20/12/17 lunch time be fine for everybody?

4) SPS TMCI with the Q22 optics (KevinL): https://indico.cern.ch/event/680365/contributions/2787276/attachments/1565241/2466245/001_TMCI.pdf

- The TMCI has been identified and measured in Q22 optics in the SPS. The instability threshold is higher than for Q26 ad lower than for Q20 optics, as predicted.

- The instability threshold is close to the 2.6E11 p/b required for LIU beams => No margin for operating at these intensity values (with low chroma).

- The TMCI could be mitigated using both the usual bunch-by-bunch transverse damper and the wide-band feedback.

5) Simulation studies for the LHC 16L2 solenoid (GianniI): https://indico.cern.ch/event/680365/contributions/2802080/attachments/1565209/2466196/000_16L2_ecloud_simulations.pdf

- Simulations assuming a perfectly conducting boundary.

- E-cloud possible 2 roles: either charging something or heating something.

- 5 studies were done in the framework of the 16L2 studies (and the installation of a solenoid) => The following answers were obtained:

- Study #1: for small dipolar fields, changes in B are expected to have a big impact on the e-cloud buildup.
- Study #2: photoelectrons can play an important role at these small fields.
- Study #3: 8b+4e scheme expected to have an impact also in the presence of photoelectrons.
- Study #4: A “feasible” solenoid can significantly mitigate the e-cloud.
- Study #5: The solenoid still works in the presence of a small dipolar magnetic field (busbars) as long as the two fields are comparable.

6) General discussion about the 16L2 instabilities (Everybody): ?

- High priority for us (DavidA, SergeyAnt, NicoloB, XavierB, Lotta, BenoitS) => Answer to question from PaulC about the 16L2 instabilities:

> - Discussing with PaulC, he would like us to work towards an explanation of these different effects for Chamonix (and in particular for the talk of DanielM on 16L2). He is especially interested in the difference between a 16L2 particle and a “standard” UFO => High priority! As discussed I proposed we follow the 2 paths:
>
> 1) The full simulation one by LottaM => Ongoing.
>
> 2) Continue with our "simple models" to try and see if this makes sense and if we can explain for instance also the coupled-bunch part and if we agree with all the numbers from AntonL (as it seems it was the case as checked in particular by XavierB et al.) and others. And in particular answer to PaulC's question => See above but a bit more detailed below:
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> "
>
> … why a particle in 16L2 starts as if it is a UFO, then sometimes can develop this instability. There is some characteristic that means that in the 16L2 case it can enter the beam and get trapped long enough for all the electrons to get stripped off – producing the very high local e- density and subsequent instability. As far as I know we have never seen a similar effect elsewhere, which means it is an inherent property of the type of macro particles in 16L2 which is different from the rest of the machine…
>
> "
>
> - Can we explain this coupled-bunch pattern?
>
> 1) Is is due to e-cloud?
>
> 2) Is it due to the ions?

3) Is it due to both?

4) Is it due to a loss of transverse Landau damping and then we see behind the instability from impedance => Would be nice to see which pattern along the ring and which instability rise-time we would have from impedance only without Landau octupoles.

5) Is it due to the fact that due to the huge positive tune shift the ADT is not working well (as there is a tune window => please check with WolfgangH and/or DanielV) and the impedance-induced instability is not damped correctly anymore?

- DavidA mentioned that he discussed with WolfgangH, who told him that if we start to be out by ~ 0.02 then ADT should start to work in a degraded mode. To be followed up.

6) Others?

- PaulC raised the question of the possible role of IBS.

- LottaM reported about some first studies she made:

- She also sees a positive tune shift with e-.

- However, when she creates the e- and ions from the ionization process, ions seem to win over e- and they have a stronger effect on beam => She could put back the space charge and she sees always a negative tune shift with ions only…

- To be continued.

7) 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.

8) Miscellaneous

- The next (129th) meeting will take place on Monday 04/12/2017 (in room 6/R-012 at 11:00 exceptionally) => Current agenda:

1) General info and follow-up (EliasM)

2) Follow-up of actions (see past minutes) (Everybody)

3) Analysis of single-bunch instability rise-times at top energy using the bunch-by-bunch activity monitor data (GiacomoM)

4) First highlights of last week's LHC MDs (Everybody involved)

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, 01/12/2017.