Minutes of the HSC section

121th meeting on Monday 02/10/2017 (10:30, 6/R-012)

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

1) Newcomers / visitors

- Debora Ventura started today as TECH with BenoitS to work on "Improvement of the PS impedance model in view of LIU".

2) Comments on the minutes of the previous 120th 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.

- 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?

- HL-LHC at ultimate energy of 7.5 TeV => Some actions from us by the end of September

  - StefanoR should send us the settings for collimators asap.

  - 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.

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

  - E-cloud and synchrotron radiation effects => Action GianluigiA, GiovanniR and GianniI

- 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".

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

- 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.

- 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.

- 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.

- 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.

- Movies for HL-LHC project (everybody) => To be discussed today.

3) General infos and follow-up (EliasM)

- News from LHC

- 16L2 instability back at flat-top for ~ 1.3E11 p/b with the solenoid.

- Some coupling measurements reveal quite some high values

- Before and after the collision process => As instability observed due to change of Qh.

- At EOS it seems it was found but after the collision bump => Due to bump? To be followed up closely.

- Meas. redone at the end of fill, 7E-3 in B2 and ~ 5E-3 for B1: due separation

bump or drift during fill?

- Effect of bump? => TOTEM last year?

- Heating observed and they had to separate.

- Comment from BenoitS: Coating for quad planned for YETS is cancelled. Looking at all coatings in LS2.

- SLM:

- The annual meeting of the Beams department will be on the 18th of December.

- The research board approved to move to the end of 2017 the special runs like the high-beta run at injection and the proton reference run, and a short Xe run. MD4 could be moved to a later time (RendeS is looking at options for the LHC schedule).

- CMS would like to have the re-alignment done during LS2. The earliest date for the opening of the valves should be retained.

- TDE status; an inspection with a robot did not show any large single leak and no damage of the Ti vacuum window. The N flux will be kept, but the dump is at atmospheric pressure.

- MD4 schedule: no doublet-beam will be used to avoid any bad surprise from 16L2.

- LSWG meeting with report from MD3 block by LeeC and DavidA.

- LBOC => For a future one, AdrianO should present his recent nice result about the stabilizing effect of SC in LHC.

- ABP-CWG meeting with AlessandraL who presented the PATH code.

4) LHC single-bunch stability predictions vs. measurements in 2017 and comparison with 2015-2016 (LeeC and XavierB): https://indico.cern.ch/event/669352/contributions/2737212/attachments/1533270/2400794/2017-10-02_compThres.pdf

- 2015: Good agreement between measurements and predictions for both FT and EOS for Q' > 2.

- 2016: Nonlinearities, providing Landau damping, observed at EOS.

- 2017:

- Nonlinearities, providing Landau damping, observed at both EOS and FT.

- With a single bunch, the required Ioct is a factor 2 to 4 higher than predicted for any Q'.

- Seems we are losing Landau damping => What could be the reason? Which MD could be done before the EOY?

5) HE-LHC injection stability estimates (DavidA and SergeyAntipov): https://indico.cern.ch/event/669352/contributions/2737213/attachments/1533279/2400810/HELHC_Injection.pdf

- They want to decide on the energy in ~ 1 month => Important consequences!

  - 450 GeV

  - 900 GeV

  - 1.3 TeV

  => Upgraded SPS would be required for last 2 options.

- The stability estimates were made scaling form the present Hi-Lumi model

- For all options the beam is stable for a damper gain of 50-100 turns

- Top energy is expected to be more challenging for beam stability

- Question from SergeyArsenyev about the gaps in sigmas for the different energies as it seems not to scale with energy.

- Next

  - Check this.

  - Look at the beam screen.

6) Movies for HL-LHC project (for general public): impedance, space charge, beam-beam, e-cloud (Everybody):

- Ecloud: https://ecloudwg.web.cern.ch/content/multimedia.

- Impedances and instabilities: https://indico.cern.ch/event/669352/contributions/2737207/attachments/1533235/2400873/movies.pdf.

- Next: space charge and beam-beam.

7) Higher-Order Multipole impedance (OlavB): **https://indico.cern.ch/event/669352/contributions/2741966/attachments/1533263/2400785/Higher_Order_BeamImpedance_OB.pdf**

- New research leading to possible elimination of transverse beam impedance by making beam equipment in the shape of higher order multipoles.

- Check the Ztrans obtained from the Zlong => Plot Zdip and Zquad.

- What about the mesh?

- Next: follow-up and compare to the case of a cylindrical tube.

8) Impedance reduction techniques (MarioSB): **https://indico.cern.ch/event/669352/contributions/2737214/attachments/1533304/2400857/HSCSM-021017-MB-Impedance_reduction_techniques.pdf**

- Nice overview of impedance reduction techniques.

- For SPS MKE the kicker length of serigraphy was reduced to avoid the line to heat.

9) 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.

10) Miscellaneous

- The next (122th) meeting will take place on Monday 09/10/2017 (in room 6/R-012 at 10:30) => Agenda:

1) General info and follow-up (EliasM)

2) Follow-up of actions (Everybody)

3) Movies for HL-LHC project (for general public): impedance, space charge, beam-beam, e-cloud (Everybody)

4) 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, 15/10/2017.