Minutes of the HSC section
108th meeting on Monday 08/05/2017 (10:30, 6/R-012)

HSC members: Javier Barranco Garcia (JBG), Mario Stefan Beck (MSB), Eleonora Belli (EleoB), Olav Berrig (OB), Nicolo Biancacci (NB), Xavier Buffat (XB), Lee Robert Carver (LRC), Giovanni Iadarola (GI), Kevin Li (KL), Elias Metral (EM), Mauro Migliorati (MM), Adrian Oeftiger (AO), Tatiana Rijoff (TR), Annalisa Romano (AR), Giovanni Rumolo (GR), Benoit Salvant (BS), Michael Schenk (MS), Claudia Tambasco (CT), David Amorim (DA), Alistair Arnold (AA), Sondre Vik Furuseth (SVF), Philipp Dijkstal (PD), Giacomo MazzaCano (GM), Galina Skripka (GS), Antonio Gilardi (AG), Francesco Giordano (FG), Sergey Antipov (SA), Laurent Barraud (LB), Felix Pol Gaston SOUBELET (FS).


1) Newcomers / visitors
- None.

2) Comments on the minutes of the previous 107th meeting + Actions
- See last minutes/actions.

3) General infos and follow-up (EliasM)
- IPAC17 next week => Finalization of presentations and posters.

- SLM:
  - New structure for the administrative support in the BE Department (as of 1 May 2017)
    - Both RonnyB and IsabelleA stepped down as Group Leader and Section Leader for the ASR-AS and ASR-RL sections.

    - The ASR-AS and the ASR-RL sections have been dissolved.

    - The Group secretary staff positions for the ABP, BI, CO, ICS, OP and RF
Groups are administratively attached directly to their Groups and the Group Leader concerned is their supervisor.

- The Central secretariat/administrative support is attached to the BE Head Office (with AnnaM as supervisor).

- DelphineR will be on detachment (18-month) to ATS-DO as of June 1st.

- Incidents of sexism at CERN

  - Members of personnel should report incidents whether they are victim or witness.
  
  - Incidents can be reported to the Supervisors who should take the appropriate course of actions.
  
  - Incidents can also be reported to the Ombudsperson or the Diversity Office, both units provide confidentiality; or simply by filing an incident on Service Now.

- GianluigiA asked if we did already DA studies with Q" to be compared to the case with Landau octupoles (MassimoG is following this). GianluigiA also mentioned that the DA studies with the RFQ should also be performed and compared to the case of Landau octupoles => LHC and SPS (MichaelS is following this).

- HPC cluster: with the help of GiovanniR, GianluigiA put together all the arguments and it has been approved at the directorate level.

- Possibility to move our offices to Prevessin: after detailed analysis (students, sources, etc.), it seems that it would not be a major issue to move there. We are therefore now ready in case of future possibility

- LHC starting well

  - This week-end some checks with BTF (it is working!) and BBLR (it is working!) were already made.

  - As mentioned already, let’s be ready to fill some slots in the coming week-ends and/or nights:

    1) Let's try each time to go through (or at least inform) our ABP coordinators.

    2) Reminder, if you need to contact me anytime, please use this email or my CERN phone or my personal mobile phone (0644298334) or my personal fixed phone (0450328556).

- ANAR2017 workshop => Welcome by FreddyB reminding that the discussions about the next European Strategy plan will start in 2019 to have a document by May-June 2020 => So if
a document will be prepared after this workshop it should be available by end of 2018.

- Discussion with AdrianO, DavidBruhwiler and Stephen Webb on the possibility for AdrianO to use the algorithm of Stephen Webb for our space charge studies on impedance induced instabilities:


  - It is symplectic and the overall momentum is conserved. The 2-particle momentum is also conserved and he succeeded to track 2 particles moving around each other forever (he did not see any growth).

  - AdrianO will try and implement his algorithm. If needed he could also visit them in Colorado at some point.

- 1-day workshop on collimation design and material => I could not attend but BenoitS gave the talk on impedance

  - Main issue is the outgassing => It seems it is not related to bulk material but to the treatment applied, aimed at attaching the coating.

  - We will look at long fingers.

- Discussion with DanielS about the RFQ for FCC

  - He would like to make the statement at Berlin that we could replace all the octupoles by some RFQs => OK.

  - He would like to push for RFQs instead of Q” as he would like the optics to remain fully independent => OK.

  - As I said we need to look at the DA comparison between octupoles and RFQ to see which method is the best.

  - Deadline/action for us: DanielS would like to make this statement in Berlin but his goal is to have for ~ November a decision to go for octupoles or RFQ.

- Discussion with SergioC, GianluigiA, SergeyAreseney, BenoitS and myself on the scientific interest of having a measurement set-up to measure impedances at cold and with magnetic field

  - Interest from FCC but SergioC wanted also to check with us => Only the scientific aspects as money wise PaoloC said that he will pay for it.

  - From impedance and instability team we said that we fully support this initiative and that we will help
- Interested to see what happens to LESS, a-C and NEG (the latter one being at room temperature).

- Will be of general interest for the full impedance community.

- I mentioned the interest also for FCC-ee by MauroM who will make recommendation to use a very thin layer of coating (~ 100 nm) otherwise the beam will become longitudinally unstable.

- As concerns the LHC and/or HL-LHC, the impedance of LESS seems second priority compared to the effect of low temperature and magnetic field on the SEY => This is the top priority. Can this be done with the same set-up? => Important info/input for SergioC.

- GianluigiA reminded that for HL-LHC the baseline scenario is to coat (with a-C for the moment) the IR1 and IR5 (up to D1), and the IR2 and IR3 with D1, D2 and matching sections => To be confirmed.

- MauroM is deriving a very simple formula for the case of a very thin coating of a worse conductor on top of a good one => Application for FCC-ee, where the longitudinal microwave instability is already an issue with resistive-wall from copper and a coating in the e+ ring is needed to get rid of e-cloud effects => MauroM will recommend a maximum thickness => To be discussed at some point in impedance meeting.

- Highlights from HiLumi workshop in Napa (Gianni):

  - Interesting meeting.

  - He discussed heat loads.

  - Crab cavities => Need to simulate e-cloud in the future and he will discuss with RamaC.

  - He discussed our simulation strategy with the LBNL colleagues => Same approach taken.

  - Talk from LeeC who applied for the Toohig fellowship.

- CST conference by TatianaR:

  - Is it possible to download already CST2017? => Improvement made with the open boundary, which is also a possibility for eigenmode (would be great according to BenoitS because TomWeiland already proposed it at the Erice workshop in 2014).

  - MauroM downloaded CST2017 yesterday for La Sapienza => Seems to work well.

  - BenoitS reminded that at CERN we need to go through DFS.

- The goal is not to re-write SixTrack but make a simpler form of it => Study simplified, yet realistic, configurations, within the reach of the available computing power.

- Main focus: study the BB effects (limitations due to large head-on beam-beam parameters), using the 4D and 6D (à la Hirata).

- From CPU to GPU they gained a factor ~ 100 depending on the simulations.

- 6D led to an increase by a factor ~ 10 compared to 4D but gives the possibility to study many effects (all this was done in GPU).

- Simulations done on the LIU-PS cluster here and GPU cluster at the home university.

- Bunch intensity losses (effect of the tails of the beam) => They had to better model the distribution
  - Gaussian => Does not work well.
  - Hollow Gaussian does not work well.
  - The uniform distribution works well => Similar to water-bag => What is the best is to have 3 regions and then weight them based on their position => Gives a nice distribution of the both the core and tails.

- Resonance canceling by choosing an intermediate phase advance => Very nice! On both emittance growth and beam losses.

- MD comparisons
  - Quite high BB tune shift of the order ~ 0.02 and always above ~ 0.015.
  - Saw clearly that we need to go to 6D as 4D simulations cannot capture all the measurements.

- Summary
  - Tools in place to study both the underlying effects and measurable quantities.
  - Results show qualitative agreement with the LHC.

- Next: continue to discuss the model and results within the BBL working group.
5) Update on power loss for resonator impedance with various filling schemes (Francesco Giordano): [https://indico.cern.ch/event/636396/contributions/2576380/attachments/1455388/2245998/Update_on_power_loss_for_resonator_impedance_with_various_filling_schemes.pptx](https://indico.cern.ch/event/636396/contributions/2576380/attachments/1455388/2245998/Update_on_power_loss_for_resonator_impedance_with_various_filling_schemes.pptx)

- Follow-up of the last talk => Answer to the questions raised last time.

- Conclusion

  - The side bands play an important role, and the way that we fill the machine has an important impact.

  - The quadratic behavior ($P_{\text{loss}} \propto M^2$) is obtained only if we have just the main line that is contributing to the power loss => In the LHC (due to the gaps), the exponent is always smaller than 2.

- Next step => Try to understand which side-bands play the most important role.

- Comment from GianniI: for the 50 ns MD it would be good to have a filling scheme very similar to 25 ns such that we can learn => To be followed-up between GianniI, FrancescoG and BenoitS.

6) Tune shift and stability predictions for the TCSPM MD (SergeyAnt): [https://indico.cern.ch/event/636396/contributions/2576382/attachments/1455366/2249539/TCSPM.pdf](https://indico.cern.ch/event/636396/contributions/2576382/attachments/1455366/2249539/TCSPM.pdf)

- We should be able to measure the tune shift from all 3 collimator stripes with the collimator half-gaps in the range of 4 – 7 coll. $\sigma$.

- Expected vertical tune shift is in the range from 1E-5 to 1E-4.

- With the smallest gap we have enough physical aperture for the beam + the kick and possible orbit errors => The physical aperture is over 5 beam $\sigma$ for $\varepsilon = 2 \, \mu m$.

- Required octupole currents should not exceed 300 A when operating at relatively low Q’ (~5), 1E11 p/b and 50-turn damper.

- Need to move TCSPM below TCP (which breaks the normal collimator hierarchy) => Could be done for single-bunch (needs to be agreed with MPP).

7) Rehearsals / main messages for the 3 IPAC17 talks (GiovanniR, MichaelS and SergeyAnt):

- GiovanniR will finally give it during the e-cloud meeting and MichaelS during the pyHEADTAIL meeting.
- SergeyAnt today => Henon-Heiles single particle dynamics at IOTA: https://indico.cern.ch/event/636396/contributions/2576383/attachments/1455236/2249547/IPAC_2017_2.pdf

  - Hénon and Heiles wanted to prove in 1964 the existence of a 3\textsuperscript{rd} invariant.
  - \( E = 1/6 \) => Chaotic => Escape energy is equal to 1/6.
  - 3-step procedure to have the Henon-Heiles Hamiltonian for accelerators.
  - Reminder: we need equal beta functions to have the (normalised) time flowing at the same pace in both \( x \) and \( y \).
  - Time independence gives an extra knob.
  - How many nonlinear elements in IOTA? There will be 1 but there could be 2.
  - AdrianO asked if they studied the effect of space charge => For the moment they want to use only pencil beams => See talk from last meeting from DavidBruhwiler who discussed the effect of space charge.
  - Summary: the talk was already in great shape => Good luck in adance!

8) Miscellaneous

- The next (109th) meeting will take place on Monday 29/05/2017 (in room 6/R-012 at 10:30) => Current agenda:

  1) General info and follow-up (EliasM)

  2) Progress/status in the different activities/projects, reports from meetings and in particular the start-up of the different machines (everybody)

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


Minutes by E. Metral, 28/05/2017.