Minutes of the HSC section

2nd meeting on Wednesday 22/01/2014 (09:00, 6/R-012)

HSC members: Olav Berrig (OB), Christian Carli (CC), Elias Metral (EM), Giovanni Rumolo (GR), Frank Schmidt (FS), Elena Wildner (EW), Elena Benedetto (EB), Michael Bodendorfer (MB), Kevin Li (KL), Tatiana Pieloni (TP), Benoit Salvant (BS), Guido Sterbini (GS), Daria Astapovych (DA), Adriano Garonna (AG), Meghan McAteer (MM), Nicolas Mounet (NM), Carlo Zannini (CZ), Nicolo Biancacci (NB), Xavier Buffat (XB), Giovanni Iadarola (GI), Adrian Oeftiger (AO), Serena Persichelli (SP), Tatiana Rijoff (TR), Magdalena Kowalska (MK), Andrea Passarelli (AP), Vincenzo Forte (VF), Danilo Banfi (DB), Javier Barranco (JB), Joseph Kuczerowski (JK).


1) Newcomers / visitors

- None.

2) Comments on the minutes of the previous 1st meeting + Actions

- No comment.

- List of actions: [https://espace.cern.ch/be-dep/ABP/HSC/SitePages/Actions.aspx](https://espace.cern.ch/be-dep/ABP/HSC/SitePages/Actions.aspx).

3) General infos

- No particular comment from anyone.

- Issue of the meeting room => I put some info on the site.

- Events => I added the HB workshop and info from WernerH that there might be a Topical CAS on intensity limitations in fall 2015.

- SOLEIL workshop last week (some comments from the participants):
  - Some more detailed highlights will be given by GiovanniR and BenoitS on Friday 31/01/14 => Should be announced at some point.
Seems it was a dense but very well organized and interesting workshop.
- 4 sessions and the session on impedance was the longest one.
- CSR (Coherent Synchrotron Radiation) is an important issue, which was discussed quite a lot.
- Concerning 2-stream and collective effects, Ryutaro Nagaoka explained an interesting instability mechanism (as he did during last year mini-workshop in Diamond devoted to RF heating issues), which requires several ingredients: RF heating => Outgassing => Fast ion instability => Transverse damper becomes unstable => Beam becomes unstable.
- There were some discussions about the TMCI in the presence of a transverse damper. Despite the fact that AlexeyB discussed this in his talk it seemed it was not clear to everybody that he could do this in his new code. Furthermore, BenoitS made some publicity for the DELPHI code from NicolasM.
- It seems some people were also quite interested in NEG coating and impedance effect.
- Question about the property of activated NEG.
- IBS => Many questions and very nice summary from YannisP.

SL meeting:

- Proposition for new ABP group information meetings => The current plan is the following:
  - Motivation: comes after requests from some people who had the feeling they were not informed enough about what was going on in the ABP group.
  - Chairman: GianluigiA.
  - Subjects (propositions) to be discussed:
    - LHC operation with emphasis on ABP issues for follow-up
    - Injector complex operation with emphasis on ABP issues for follow-up
    - Machine development studies and progress
    - LINACs and REX-ISOLDE
    - H- Source
    - LINAC4
    - CTF3
    - PSB Upgrade
    - PS Upgrade
    - SPS Upgrade
    - HL-LHC
    - LHC Collimation
    - TLEP, VHE-LHC
    - Neutrinos
    - ELENA
    - CLIC and LHeC
    - Medical machines
    - Plasma Acceleration Network
    - Others? => Codes evolution: MADX, Sixtrack, etc.
  - Organization: Every ~ 1 or 2 months, only few minutes / subject, slides or not?, etc. => Ongoing discussions. No fixed speakers / arguments. In principle anybody is a potential speaker.
  - First reactions?
- Quite a long discussion about it and it seems there was some skepticism about this new meeting, as the info should be available already in other meetings.
- Seem that the people interested by this meeting are not from this team.
- Any other comment / suggestion? => See Action 1 below.

- All MARS have been scheduled => Please try and prepare them as much as possible.

- LHeC workshop on 20-21/01/14.

- Optics for PSB (OlavB) => Ongoing with goal to finalize all the work before the end of March.

- A space charge meeting took place and there will be a beam-beam meeting on Friday and an impedance meeting on Monday.

- Current impedance measurements on SPS wire scanner.

- LBOC meeting yesterday:
  - New LSA API & DB structure => Should be released to production in ~ end of February: New trim, new settings copy, new generation, etc.
  - Injectors will test this for the LHC…
  - Old info will still be around be not accessible as before.

- Info from MassimoG about “Google summer code 2014”:

  Google has launched once more the “Google summer code” project. This means that Google will select a number of projects in the domain of software development and will provide financial support to the students that will be interested in working on these topics. The only strict condition is that the software project has to do with official open source code. The students will work full time, but remotely, on the projects for a period of three months. Last year PH-SFT, the group in charge of software development in PH, got up to eight students of good quality (in any case similar to the quality of the CERN summer students, with the advantage that the Google students will work 100% in the project).

In the HSS section, they are going to make proposals and it could be of interest for our section too.

In case of need, please contact Riccardo as some administrative steps should be taken and he is in touch with J. Apostolakis who offered some help.

Some relevant information can be found here:
http://indico.cern.ch/getFile.py/access?contribId=3&resId=0&materialId=slides&confId=272294
http://sftweb.cern.ch/gsoc13

- The directorate plans for a Chamonix-like workshop on 22-27 of September 2014.

- IEFC => Studies to decrease the # of extraction kickers in LSS4 following the CNGS stops were presented. No decision yet.
- Continuation of discussion about the new HSC section: acronym and mandate => Name HSC as:

  - The 1st priority for our team is to improve the performance of the running machines (LHC and injectors), which are all Hadron Synchrotrons.

  - The 2nd priority is to contribute to the 2 projects LIU and HL-LHC to improve the LHC injectors and the LHC, which are all Hadron Synchrotrons and to build ELENA, again Hadron Synchrotron.

  - 3rd priority is to participate to the study for future circular colliders and in this case some studies on leptons should / will be made => This is in the mandate but not in the name as it is not our main activity.

4) Sensitivity of LHC ADT to intra-bunch motion (GerK): [https://espace.cern.ch/be-dep/ABP/HSC/Meetings/ADT_Sensitivity2IntraBunchMotion_22Jan14.pptx](https://espace.cern.ch/be-dep/ABP/HSC/Meetings/ADT_Sensitivity2IntraBunchMotion_22Jan14.pptx)

- GerK first reminded us about the LHC ADT (transverse damper):

  - Key elements:
    - Beam position monitor(s)
    - Signal processing system
    - Power amplifiers
    - Electrostatic kickers

  - Key parameters:
    - Feedback loop gain, phase, and total loop delay
    - Kick strength
    - System bandwidth

- The goal is to look at what the Analog Front-End is doing => Apply and test various input combinations and evaluate the output responses.

  - BPpos = Beam Position Module => Calculates normalized beam position bunch by bunch, independent of intensity

  - BPMC = Coupled type Pick Up
- Coaxial transmission lines

- 180 deg hybrid: delta and sum => Time and frequency domain

- Intra-bunch motion = modulation

- Band pass filter 400 MHz => Why Band Pass Filter? Look only at 400 MHz component. Harmonic chosen for simplicity: less complexity in terms of HW. “Sampled line” type comb filter (9 sections => want the maximum number without touching the next bunch)

- Band Pass Filter response

- Band Pass Filter output: sum and delta signals

- I/Q in baseband (demodulator) and then need to sample it.

- Numerical simulations

  - MATLAB SIMULINK model (reference) with all blocks included, but simulations are time consuming

  => Exploit the analytical approach and verify versus MATLAB SIMULINK.

- First work done for the 2 beams: 25 ns and 5-20 ns (doublets beam for scrubbing run)

  => Odd modes are not visible => The system is sensitive to beam profiles and symmetries.

- Detailed study on transverse excitations (intra-bunch motion): Symmetric and Asymmetric excitations:

  - Signals from even-symmetric intra-bunch movement > 20 MHz are seen by the damper, which applies a corrective measure but in baseband (i.e. up to 20 MHz).

  - Signals from anti(odd)-symmetric intra-bunch movement are not visible but can made accessible with only minor firmware update (already for the next run => So we should go for it!)

    => Could be a diagnostics indicator (“only”, as the information on the excitation frequency is lost) of the presence or not of transverse instability.

- The damper sensitivity is a function of the longitudinal bunch spectrum (and the oscillation frequency) => Notches in the beam spectrum will make the damper blind for certain frequencies (note: these frequencies are different from the notches).

- Practical implementation
- Note: Asymmetric bunches (longitudinal profile) is not a pb in the LHC due to the slow acceleration but it is in the SPS.

- Comment from AlexeyB to GerdK (email after the meeting): AlexeyB reminded that his model assumes that the damper sees independently individual offsets of bunch centroids and react linearly, kicking every bunch proportionally to its own centroid offset; these kicks are assumed to be flat along every bunch, they do not change within the bunch length. In other words, the kick is not sensitive to the intra-bunch motion, as soon as the centroid does not move... this center of mass (CM) assumption seems to work well for symmetric, or even, intra-bunch perturbations, but may be it is not as good for the odd ones. Could we have a number, showing how significantly the damper kick value changes, when we are applying even or odd perturbations on the intra-bunch motion?

5) Simulations of wide-band feedback systems (KevinL)

- Postponed.

6) Actions to be taken for the next meeting

- New:
  
  - **Action 1 (everybody)**: Think about the (proposed) new ABP information meeting.

  - List of all actions: https://espace.cern.ch/be-dep/ABP/HSC/SitePages/Actions.aspx.

7) Miscellaneous

- The next (3rd) meeting will take place on 29/01/2014 => Agenda:

  1) A biomedical research facility at CERN based on the Low Energy Ion Ring (AdrianoG)

- Important events and dates for HSC: https://espace.cern.ch/be-dep/ABP/HSC/SitePages/EventsAndDates.aspx.
- Preliminary agendas for the next meetings: https://espace.cern.ch/be-dep/ABP/HSC/SitePages/MinutesOfMeetings.aspx.


Minutes by E. Metral, 28/01/2014.