Minutes of the HSC section

58th meeting on Monday 28/09/2015 (14:00, 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), Nicolo Biancacci (NB), Alexander Huschauer (AH), Giovanni Iadarola (GI), Adrian Oeftiger (AO), Tatiana Rijoff (TR), Letizia Ventura (LV), Claudia Tambasco (CT), Magdalena Kowalska (MK), Andrea Passarelli (AP), Annalisa Romano (AR), Michael Schenk (MS), Vincenzo Forte (VF), Javier Barranco (JB), Aaron Paul Axford (APA), Malte Titze (MT), Francesco Paciolla (FP), Mario Stefan Beck (MSB), Stefan Hegglin (SH), Alpo Valimaa (AV), Hannes Bartosik (HB), Lee Robert Carver (LRC).


1) Newcomers / visitors

- None.

2) Comments on the minutes of the previous 57th meeting + Actions

- These minutes should be released soon…

3) General infos

- SL meeting:
  
  - BEMB
    
    o High structure defined => Can access it via the link: http://home.web.cern.ch/about/structure-cern.
    
    o SimoneG will become GL of EN/STI as of 01/012016 (replacing RobertoL who will become EN department head). Congratulations SimoneG!

- Reminder IPAC’16 abstracts to be sent to me by Friday 16/10 at 09:00.
- Extended E-cloud meeting last Friday with vacuum and cryo experts => Summary prepared by Giovanni R and it will be reported at the coming LMC by Gianni I.

- Chandra B (from FNAL) proposed his help => To be discussed within the e-cloud team as he performed several studies in the past.

- LBOC and LSWG meetings => Next LSWG tomorrow with slides from Gianni I, Lee C and Tatiana P.

- E-lens as space charge compensator => Frank S prepared a summary, which we will discuss soon with Hermann S.

4) Brief performance reports for the different machines

- PSB (Magda K and Vincenzo F)

  - Picture of the week: https://espace.cern.ch/be-dep/ABP/HSC/Meetings/Long_sc_defocusing_28092015.pdf.

  - Last Friday J.M. Nonglaton and I have set up an MD cycle with for the injection in a 50 MeV flat bottom. I wanted to try a capture in a waiting bucket h=1 / 8 kV to see some longitudinal space charge defocusing, as suggested by Giovanni at the PSB Injection meetings. It seems that there is some effect just changing from 1 to 2 turns. This can be useful for further code benchmarking measurements vs. simulations, but it requires a more systematic study (discussions with the RF team are on-going).

  Week 39 accommodated 3 MDs: “Brightness Curve” (B. Mikulec, G. P. de Giovanni) and “Using Finemet at a C16 type cavity for longitudinal blow up” (A. Findlay). There was one dedicated MD: “L2 SEM Grids Measurements” (B. Mikulec, M. Bozzolan and G. P. de Giovanni).

  Next week, the MD time in PSB will be dedicated to the “Brightness Curve” (still ongoing) and “Tails Repopulation” (Magda & Elena).

  The only major problem of the week occurred on Tuesday morning when the MPS and some other power supplies tripped. The reason was an interlock rack powered down and problem was solved, however once the rack was powered again, some still power supplies were malfunctioning; they sent from time to time the wrong ccv value (one of another user) to the magnets. This perturbed operations during the whole day (LHC filing was possible) and could be fixed only in the evening. Beam was back around 20:30. The reason was turned out to be the CPUs of some power supplies, which got saturated when the display was switched on. Switching the display to ‘economy’ mode cured the problem immediately.

- PS (Guido S and Alex H)

We were trying to improve the longitudinal structure of the spill to reduce the spikes the SPS was complaining about. An iteration on the debunching with Heiko did not really improve the situation and one of the remaining equipments to check was the TFB. We knew from experience in the past that the harmonic used to excite the beam plays an important role and recently, Thomas informed us about the presence of a significant frequency component at h=9 seen in the FFT of the spill in the SPS, which corresponded to the harmonic we were using. Until recently we were programming the frequency of the TFB at a level of 1E-2, i.e., f=9.25, as this was the available precision of the knob. However, with the help of Denis from OP Guido realised last week that the frequency can actually be programmed in steps of 1E-4 and the knob in the working set was changed accordingly. In the attached plots you see the enormous improvement of the structure of the spill by changing the frequency by as few as 1E-3.

We assume that this is due to several reasons: on the one hand we are not exactly certain by the frequency that the TFB actually provides and on the other hand there are the facts of the non-vanishing tune spread of the beam and the change of the tune during the splitting to separate the islands. The interplay of these effects causes the most effective frequency to be different from 0.25. We also did a scan of the main harmonic just to find that there is no significant impact of it once the fractional tune was set correctly.

I would say we have seen another very successful week for MTE, but the observations mentioned above highlight once again how delicate it is to set up this process in the machine.

PS: the visible drop of intensity between the islands and the core corresponds to the losses at the dummy septum during the rise time of KFA71. We assume that this effect will be less pronounced once both septa are correctly positioned to provide shadowing.

- Wednesday MD (as mentioned last week by HannesB).

- SPS (HannesB)

  - Picture of the week: https://espace.cern.ch/be-dep/ABP/HSC/Meetings/2015.09.28_SPS_picture_of_the_week.pptx.

  - MD with 8b+4e beam: 7 bunches on h = 7 (was 6 bunches in the past) + high intensity this time => ~ 1.9E11 p/b within ~ 2.3 microm (56 bunches in total).

  - Still need to do the 2 batches in the SPS.

  - Only pb in the SPS with this beam is the ZS which is sparking but it seems there is a quick conditioning.

- LHC and HL-LHC (EliasM)


  - MD 2nd part of the train instability MD last Tuesday => Lost all the day and the MD could finally not take place.
- An interesting test was nevertheless done with the TDI8, which was put in and out at injection and we saw no visible effect on the synchronous phase shift => To be looked at in detail.

- Fill 4410 went very smoothly with no BU on B2. Increasing the Temp of the beam screen to be able to go to 40 K – 40 min was a good thing as we went to 38 K for few min on a sector. GerardF is still worried that we are close to the limit on one sector (seems 1-2 or 3-4). Still under analysis… => To be discussed tomorrow morning.

- Some beam-induced RF heating observed on some collimators => Under discussion.

- Week-end studies (BenoitS et al.): [https://espace.cern.ch/be-dep/ABP/HSC/Meetings/Fillsthisweekend_BS_28-09-15.pptx](https://espace.cern.ch/be-dep/ABP/HSC/Meetings/Fillsthisweekend_BS_28-09-15.pptx)

  - Looked at the 1st emittance blow-up at injection => H/V, injected batch or circulating batch, etc.

  - Could the injection instability on B2 be due to the TDI8, either due its larger impedance measured in the past (~ 4 times larger tune shift than TDI2) or due to the fact that after a long fill, the TDI8 heated a lot and deformed more and led to important trapped modes? => Seems that we had cases of instabilities when the temperature of the TDI8 was low.

  - Proposition to fill B2 first and the B1 as on B1 no blow-up has been observed for some time.

  - Some slides from YuriA to try and understand the recently observed instabilities during OP scans: [https://espace.cern.ch/be-dep/ABP/HSC/Meetings/Pi-modewithoffset_YA_28-09-15.pdf](https://espace.cern.ch/be-dep/ABP/HSC/Meetings/Pi-modewithoffset_YA_28-09-15.pdf)

    - At ~ 2 sigmas separation, this is where the gap between the Pi-mode and the incoherent spectrum is the largest => More difficult to bring the Pi-mode inside the incoherent spectrum and therefore reach stability.

- **LEIR (MichaelB)**

  - LEIR delivers beam to the PS within the required beam parameter limits (intensity, emittances, stability).

  The LEIR MD from last Wednesday was not successful due to issues in the cycle generation process. The whole day was covered with debugging this very process. In more detail:

  - We have tried to generate a 4.8s long cycle (4 basic periods of 1.2s) on Wednesday Sept. 23rd. This was delayed due to (already well known and still unsolved) issues with the cycle generation process. However, meanwhile (Monday, Sept. 28th) we have stable injections on a 1.2s longer flat low energy plateau.

  - Once more we have seen that the LEIR transverse feedback damper is destructive to the ion beam in LEIR on the low energy plateau if, and only if, RF setup is carried out properly. It remains yet to be determined whether or not a successful RF-capture itself
is necessary for a constructive operation of the LEIR transverse feedback damper. We can accumulate stable intensity in LEIR up to around $5 \times 10^8$ ions per bunch with 2 bunches ($5 \times 10^{10}$ total charges in LEIR). Beyond that the lack of active transverse beam stabilization of the transverse feedback damper, the lose beam and end up with an unstable operation, delivering much less beam than $5 \times 10^8$ particles per bunch (with two bunches).

- Now, we have an MD cycle which allows us to inject 6 additional multi-turn injection, making it a total of $7 + 6 = 15$ injections. This shall allow us to accumulate the necessary beam intensities to study the well known but yet not understood low energy beam in LEIR during and following the RF-capture.

5) Status of the b-b WS measurements in the PS (VincenzoF)
- Postponed to next week.

6) LHC azimuthal and radial instability pattern (from impedance) at injection and 6.5 TeV (NicoloB): https://espace.cern.ch/be-dep/ABP/HSC/Meetings/HSC_27092015_NB.pptx
- Seems that we obtained a good agreement with DELPHI / pyHEADTAIL predictions and measurements at 6.5 TeV => Still under analysis.
- pyHEADTAIL simulations should be performed at injection to complete the DELPHI predictions => Important results to have to be able to compare with the often observed instabilities at injection.
- NicoloB mentioned that these results have been obtained without putting the TDI IN => To be included at some point.

7) Actions to be taken for the next meeting
- List of all actions: https://espace.cern.ch/be-dep/ABP/HSC/SitePages/Actions.aspx.

8) Miscellaneous
- The next (59th) meeting will take place on 05/10/2015 => Agenda:
  1) General info and follow-up (EliasM)
  2) Performance reports for the different machines (PSB, PS, SPS, LHC and LEIR) => With ideally a picture of the week!
3) Status of the b-b WS measurements in the PS (VincenzoF)

- 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, 29/09/2015.