Minutes of the HSC section

54th meeting on Monday 31/08/2015 (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 Bartosiki (HB), Lee Robert Carver (LRC).


1) Newcomers / visitors

- Yuri Alexahin (from FNAL) who will work with us for 2 months (September/October) => Office 10-1-005.

2) Comments on the minutes of the previous 53rd meeting + Actions

- No comment.

3) General infos

- SL meeting:

  - Action from last meeting: ABP barbecue on 17/09/15 => I did not receive any proposition… We still have some time but please contact Delphine (with cc to me).

  - There are changes for HL-LHC and LaurentT will join in the project office and stopped as group leader.

  - BE workshop will take place again this year.

- LMC:
The status of the LHC has been reviewed: worth mentioning is the observed loss of conditioning following the scrubbing run at injection. Apparently, conditioning can be recovered quickly.

It has been decided not to reduce beta* in 2015. However, all studies in progress to assess the feasibility of this option should be pursued. Also beta* in IP2 for the ion run will be 80 cm as well as in IP1/5.

- LBOC

  - Follow-up of the last one => LeeC on chromaticity tool with OP colleagues.

  - Tomorrow: review all the LHC instabilities observed so far.

- LIU-SPS coordination meeting about possible impedance reduction (and synergies with possible coating with a-C coating).

  - Follow-up of Olav’s talk at the LIU-PSB meeting to discuss issues with the BI line => Discuss with Alessandra (was this done already? do we need to include space charge? etc.).

  - BB meeting after this meeting => Update on the implementation of 6D beam-beam lens and Crab Cavity in SIXTRACK by Javier Barranco Garcia and Summary of instability observations at end of squeeze and after by TatianaP.

4) Brief performance reports for the different machines

- PSB (VincenzoF)

  - Picture of the week: https://espace.cern.ch/be-dep/ABP/HSC/Meetings/week35-pics.pdf.

Calm week for the PSB: only minor issues from an OP point of view.

MDs are on-going:

MK: Feasibility of the new shaving scheme. She performed final MDs to write the report and move to the implementation phase. Then she is working on the tails repopulation with the AD beam (intensity 400e10p+) to observe the time needed to repopulate the tails after scraping the beam at the absorber. This study is in initial phase.

VF & FS: Half-integer investigations for space charge “Master experiment”. Conditions slightly changed from Feb2013. The vertical tune to obtain the “double knee” shape losses with long bunch is now 4.52 (4.53 before), but the machine has changed (realigned, …)! Close to the resonance, as expected, minimum variations of tunes generate different loss paths. An excellent correction has been implemented through the QNO816L3 (dominant at -3.25A) + QNO412L3 (+0.3A). Through this we
can achieve ~4% losses along 200 ms (from 450 to 650 ms). Also short bunch behaviour has been analysed (RF phase is an “easy” parameter to change in one-shot the space charge forces).

**RF people:** Finemet analysis.

**GP & BM (OP):** brightness curve measurements (repetition of 2012 measurements) – only Ring 2 for the moment (new wirescanner on ring 3 vertical from this wednesday).

**- PS (GuidoS)**

- **Picture of the week:** [https://espace.cern.ch/be-dep/ABP/HSC/Meetings/PS.png](https://espace.cern.ch/be-dep/ABP/HSC/Meetings/PS.png) => Screenshot just in front of the dump.

The PS had an excellent week with a high machine availability.

The week however started with a problem on KFA4 that did not pulse from time to time during the weekend, causing radiation alarms for nTOF. The replacement of an electronic card solved the problem.

During the routine beam quality measurements on the 25 ns LHC beam the beam was found to become unstable in the vertical plane towards the end of the ramp. This was corrected by slightly increasing the vertical chromaticity.

Saturday morning the nTOF beam was stopped due to a problem on a power converter of a quadrupole in the transfer line. Unfortunately the knob showed the correct acquisition and status, as it was not updating, making diagnostic difficult. This is an issue on quite a few converters since the renovation done during LS1.

Throughout the week the MTE beam was send regularly to the SPS for further setting up on the SPS side.

HeikoD and Letitzia made a first MD to damp longitudinal CBI with finemet => 1st time the finemet cavity was used to damp!

TFB: FreddyB replaced today the firmware and HW of LLRF to allow gating on single-bunch => opens the possibility to kick only 1 bunch. The proof was done with the analog RF and it has to be proved with the digital RF.

**- SPS (HannesB and/or BenoitS)**

- **Picture of the week:** [https://espace.cern.ch/be-dep/ABP/HSC/Meetings/SPS.png](https://espace.cern.ch/be-dep/ABP/HSC/Meetings/SPS.png) => MTE losses in the SPS : reduction from ~ 9-10% to ~ 1% at injection after optimization of the trajectories in TT2-TT10.
In week 35 the SPS was juggling between NA physics, SPS MD and providing beam for the LHC MDs. The beam quality to the NA suffered at times due to the continuously changing super cycles.

The BLM on ZS3 is broken and needs an access to repair. The repair is scheduled during the technical stop.

Work on the MTE cycle SFTPRO2 has started. This cycle accelerates the beam to 400 GeV and is extractable to the NA. The beam is now correctly injected with comparable losses at injection as the CT cycle. (On the flat bottom the losses are still higher.) Setting up of injection took longer than expected due to the change of optics in TT2 and TT10 in the weeks earlier, which had been generated but not driven on the MD cycle. The copy from the MD cycle to the SFTPRO2 resulted therefore in very different trajectory and setting up had to start from scratch. Not much progress could be made yet to improve the transmission along the acceleration. Work on the cycle will have to continue after the technical stop.

Almost 7 h of downtime were accumulated due to recurringly inconsistent current references from the main bend circuit to BETS (Beam Energy Tracking System) of the SPS beam dump kickers. On Friday EPC thought that the problem might be caused by a dying auxiliary power supply and exchanged it. But the problem re-occurred during the weekend. To be followed up.

The magnet patrol for the vacuum leak in 308 is scheduled for 8am Monday morning. The beams will be stopped at 7am.

- **LHC and HL-LHC (EliasM)**

  - See picture: [https://espace.cern.ch/be-dep/ABP/HSC/Meetings/HSC_EM_31-08-15.pdf](https://espace.cern.ch/be-dep/ABP/HSC/Meetings/HSC_EM_31-08-15.pdf) => Need to disentangle between coupled-bunch effects from impedance/damper and e-cloud effects (or interplay between between the two) => Data analysis + next MDs (train of 50 ns vs. train of 25 ns, etc.).

  => If this is confirms that e-cloud plays a significant role in the instabilities, the sign of the octupoles might not be the correct one… => To be checked carefully!

  **NEXT MDs:**

  1) 50 ns vs. 25 ns?
  2) Negative octupoles polarity?
  3) Higher chroma?
  4) Etc.

- **LEIR (MichaelB)**

  - Excused.
5) Status of the ELENA project (ChristianC):  
https://espace.cern.ch/be-dep/ABP/HSC/Meetings/15_08_31_ABP_HSC_Section.pptx?source=doc/be-dep/ABP/HSC/Meetings/15_08_31_ABP_HSC_Section.pptx&default&Source=https%3a//espace.cern.ch/be-dep/ABP/HSC/Meetings/Forms/AllItems.aspx&DefaultItemOpen=1&DefaultItemOpen=1

- ChristianC reviewed the status of the ELENA project.

- Reminder: Electrostatic lines are present at CERN for ISOLDE. ASACUSA has also some electrostatic elements.

- The magnets series production has been launched (after some checks with OlavB) ~ 1 month ago.

- GBAR experiment was approved and proposal to move AEGIS.

- Reminder: Most of commissioning can be done in // to AD.

- Collective effects in ELENA: All the work done by TatianaR revealed that this should not be an issue.

- Summary:
  
  - Space for ELENA free after re-installation of kicker generators in annex building and AD restart.
  - ELENA Installation started and ongoing.
  - Hardware construction ongoing.
  - Small delays, but nothing dramatic for the moment.
  - Proposal to re-install AEGIS in new exp. zone to be clarified soon (impact on hardware construction).
  - Outlook:
    
    - Installation of ELENA ring until early summer 2016
    - ELENA ring commissioning until late autumn 2016 (challenging)
    - First physics experiments with 100 keV possible in 2017 (Gbar)
    - Discussions with (existing) experiments on scheduling of replacement of magnetic lines from AD by electrostatic lines from ELENA
      - Decision to be taken in autumn 2016 (depending on progress with ELENA and general CERN schedule)
      - Depending on the decision, 100 keV antiprotons in existing experimental are end of 2017 or in 2021 (after LS2)

6) Thin-Lens Implementation of Combined Function Magnets in MAD-X (MalteT):  
https://espace.cern.ch/be-dep/ABP/HSC/Meetings/slides_MalteT_04-09-15.pdf

Motivation from FrankS: We had been suffering from a 16% change of the chromaticities when going from the thick to the thin lattice of the PS with combined function magnets => MalteT developed a new thin lens module of the combined function magnet that recovers the correct thick lens chromaticity of the PS.

- MalteT explained the method he used, discussing its 3 steps:
  
  1) Constructing the vector potential
2) Obtaining the symplectic map => Thick transformation map of a combined-function magnet (analytical map for all orders in deltas)

3) Thin lens implementation

- Reminder: SI units are used.

- The final result is shown in slide 14, comparing to the other codes (1\textsuperscript{st} results obtained last week):

  1) Old code (i.e. MAD-X as it is, in thin) => Not OK.

  2) New code (i.e. MAD-X with this new module from MalteT) => Seems OK as very similar result as in 3).

  3) Thick code (MAD-X).

- Next step: MalteT and FrankS will discuss with all the code developers to include this new module in our 3 codes (MAD-X, PTC & SixTrack).

7) **Actions to be taken for the next meeting**

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

8) **Miscellaneous**

- The next (55th) meeting will take place on 07/09/2015 => 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) Panofksy-Wenzel theorem (Francesco Paciolla)

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

- 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).
