Minutes of the HSC section

65th meeting on Monday 07/12/2015 (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), Kevin Li (KL), Tatiana Pieloni (TP), Benoit Salvant (BS), Guido Sterbini (GS), 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), Eleonora Belli (EB).

**Present/Excused:** OB, CC, EM, GR, FS, EW, EB, KL, TP, BS, GS, NB, AH, GI, AO, TR, LV, CT, MK, AP, AR, MS, VF, JB, APA, MT, FP, MSB, SH, AV, HB, LRC, EB, Nawang, MatthewC.

1) Newcomers / visitors

- None.

2) Comments on the minutes of the previous 64th meeting + Actions

- No comment.

3) General infos

- SL meeting:
  - Nothing special to report.

- Reminder/comment for IPAC16 abstracts (and any other publications) => Try and include as much as you can our close collaborators (as ADT/RF, BI and OP colleagues).

- Starting from the 1st of December 2015 KlausH will replace SimoneG as Activity Coordinator for LIU-PS, since SimoneG will start his new role as EN/STI group leader from 1st of January 2016.

- Email from PaulC on Linac4 results:
- Linac4 commissioning team have successfully accelerated a H-beam to 50 MeV.

- Linac4 commissioning will continue with the characterisation and measurements of the beam at this energy before continuing with the staged installation of the accelerating structures followed by beam tests at 100 MeV in spring 2016.

- Commissioning to the final Linac4 energy of 160 MeV will take place later next year.

- Training session on LabVIEW for equipment access on 03/12 (https://indico.cern.ch/event/464365/) => Seems it went well from OlavB and that it was quite interesting from GuidoS. We can access Timber, equipment, etc. and there are a lot of possibilities. GuidoS et al. are using heavily Mathlab but Labview seems to be the most complete tool at the moment. Please don’t hesitate to contact OlavB.

- Impedance meeting this morning (NicoloB)

  - New TDI with ceramic blocks have been changed from ceramic to graphite => For 2016.

  - 1 microm of Ti put on Al => GianniI confirmed that this is mainly to avoid outgassing.

- BBLR workshop where we discussed the tests to be performed in 2017. TatianaP gave a talk on BTF.

- LSWG => Reminder on the MD notes to be written asap (many thanks in advance)!

- Instability observed with ions => Will be discussed today and we should also make quantitative predictions for the future.

4) Brief performance reports for the different machines

- PSB (VincenzoF)

  - PSB is stopped. Ongoing discussions with OlavB, OP, LIU etc. on the issue with the PSB injection lines.

- PS (GuidoS)

  - Picture of the week: https://www.evernote.com/l/AD2i78p8ezBP9qMAw1RI8bQv4GHUZy2MUBk.

  The operation with ions was smooth. PS is providing 5e10 charge per cycle. There are still the oscillations at the injection 30 mm peak-peak), but we cannot easily measure the chromaticity (since we cannot significantly move the radial position).
- SPS (HannesB)

On Monday the beam transmission on the nominal LHC ion cycle with 12 injections could be improved from 60% to 80% by optimising RF parameters around transition (RF voltage dip at transition, phase loop gain optimisation after transmission). Since then intensities higher than 4e11 charges could be successfully transferred to the LHC.

The North Area ion run finished on Tuesday at 8:30 when the beam was stopped for the planned oven refill of the Linac3 ion source. During this intervention, one of the thyratrons for the MKP injection kicker was exchanged in order to reduce the kicker rise time in view of further decreasing the batch spacing between two injections in the SPS. Some difficulties due to large transverse emittances on every other bunch and losses in the transfer line (in particular T18) were encountered during LHC filling in the evening. The problem could be mitigated by adjusting the injection kicker delay and the settings of the transverse damper by the specialist who was called in during the night. Further investigations on ABT side on Wednesday morning revealed a bad synchronisation of the injection kicker generators after the thyratron exchange, which had resulted in a large jitter of the kicker pulse. After the kicker specialist re-optimised the synchronisation of the MKP generators on Wednesday, a batch spacing of 175 ns (instead of 225 ns) could be achieved in the SPS with no measurable impact on transverse emittances and bunch intensities. This reduced batch spacing is now used by default for LHC ion filling since the successful injection tests on Friday.

Thursday and Friday were devoted to the UA9 run with coasting ion beams.

- LHC and HL-LHC (EliasM)

- Nothing special to report except the observations of instabilities with ions discussed below.

- LEIR (AlexH)

- Excused => Profiting from the last days with beam… Discussing with AlexH and SteveH at the CCC I saw some nice pictures of bunch shortening… To be followed up.

5) Summary of the 1/2 day space charge meeting on 07/10/15 (FrankS): https://espace.cern.ch/be-dep/ABP/HSC/Meetings/HSC_frs_07.12.15.pptx

- With SixTrack we expect the SC computations to be ~ 10 times faster.

6) Summary of the ions instabilities observed in the LHC (LeeC and TatianaP)

- LeeC: https://espace.cern.ch/be-dep/ABP/HSC/Meetings/4668_LMC-2.pptx

- Fill 4668 was dumped due to a coherent instability with ions.
Chroma was raised from 5 to 8 and some octupoles current was introduced (+1 in octupole knob => 270 A).

=> We need to make some quantitative predictions of beam stability for the future.

- TatianaP: https://espace.cern.ch/be-dep/ABP/HSC/Meetings/Ions7Dec2015.pdf

- Instabilities in stable beam:

- Fills analysed: 4664 and 4666 (B1V instabilities), 4669 and 4671 (i.e. after the modifications mentioned above by LeeC => No instability).

=> Seems the improvement did not come from the octupoles but from the chroma and/or ADT… To be continued.

7) Destabilizing effect of linear coupling in the LHC: can this explain some instability observations? (LeeC-MichaelS-EliasM): https://espace.cern.ch/be-dep/ABP/HSC/Meetings/DestabilisingEffectOfLinearCouplingInLHC_EM.pdf

- First simulations have been made with pyHEADTAIL, which revealed that linear coupling between the transverse planes can lead to a loss of Landau damping and make the beam unstable. This is just the beginning of the studies, several simulations are still running (as we need to track at least ~ 500 kturns and certainly more), but the goal of these studies is to define the acceptable limits in terms of maximum acceptable linear coupling strength (i.e. closest tune approach) during the cycle and the minimum distance between the transverse tunes.

8) AOB: any other important/interesting information from the different projects/studies (LIU, HL-LHC, ELENA and FCC) and from the different working groups (SC, EC, BB, IMP and HDWG)

- Nothing to report.

9) Actions to be taken for the next meeting

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

10) Miscellaneous

- The next (66th) meeting will take place on 14/12/2015 (at 14:45. Please note unusual time due to the ABP group meeting!) => Agenda:

  1) General info and follow-up (EliasM)
2) Very brief performance reports for the different machines (PSB, PS, SPS, LHC and LEIR) => With ideally a picture of the week! And let's concentrate only on beam dynamics issues/results (operation and MDs)

3) Multipole expansion of the transverse impedance through the wire measurements (FrancescoP)

4) AOB: any other important/interesting information from the different projects/studies (LIU, HL-LHC, FCC, ELENA) and from the different working groups (SC, EC, BB, IMP and HDWG )?

5) Coffee together at the PS cafet (I will bring the chocolates...) => So we have to finish the meeting at 15:55 at the latest!

- 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, 14/12/2015.