Minutes of the HSC section

109th meeting on Monday 29/05/2017 (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 108th meeting + Actions
- See last minutes/actions.

3) General infos and follow-up (EliasM)
- IPAC17 was great with our group leader chairing it and 3 excellent talks from GiovanniR, MichaelS and SergeyAnt.

- I was in Rome last week for some courses on beam instabilities: https://indico.cern.ch/event/642686/contributions/2607743/attachments/1466612/2267602/CourseOnBeamInstabilities_LaSapienza_2017_EM.ppt.

- SLM: I was not there and there is nothing worth reporting.

- Coming talk from NicoloB “LHCb Velo RF foil studies” at the workshop Beyond the LHCb Phase-1 Upgrade Workshop, Elba, 30th May 2017.

- Special high intensity 25 ns SPS scrubbing run (HannesB and GiovanniR):
- Planning to perform a high intensity SPS “scrubbing” run with 25 ns beams towards the end of this years' SPS proton run. The aim is to study beam performance, vacuum, beam instrumentation, kicker heating, … with “as close as possible to” LIU beam parameters (at least concerning intensity per bunch). The proposal is to have a total of 40 hours machine time for this exercise:

- 24h starting Monday October 9, at 9:00 (—> until Tuesday 9:00)
- 16h starting Wednesday October 11, at 8:00(—> until midnight)

- WP2 actions

1) 13/6 CC review => BenoitS will not be here but his part could be covered by SergeyAnt & NicoloB.

Following a contribution from RF on performances and operational aspects of CC:

- Review of expected CC heat loads due to impedance (SergeyAnt)
- Review of tolerances to CC phase noise (emittance blowup, ...) (XavierB)
- Summary of expected bunch to bunch displacement at the CC with pacman effects (XavierB)

2) 27/6 Vacuum review

Following a contribution from Vacuum:

- Review of vacuum design choices of all IRs, coated locations and materials, expected SEY
- Review of transitions, which types of RF fingers and where, where no RF fingers
- Copper thickness for the beam screen (thin for quenches, thick for resistive wall impedance)
- Review of recommendations from impedance and e-cloud simulations concerning the aspects above (BenoitS and GianniI).

3) 4/7 Heat Load review

Heat load review after the statements emerged in the previous meeting (GianniI)

- 1st transverse instability for 2017 observed on Saturday 13/05 at 14:00 => It seems that according to StefanoR, the collimators were brought closer than nominal gaps during the alignment procedure.
- Impedance and instability studies by XavierB et al. on Saturday night 20/05/17 + follow-up of several instabilities observed during the commissioning => See talk from XavierB below.

- LSWG on 23/05/17 with several talks from our team (on 50 ns, emittance exchange with linear coupling, train instability threshold, impedance measurements of TCPSM collimator).

- Impedance ATS-WG meetings (recommendation from the IWG for the LIU-SPS vacuum flange review, WOW Crab cavity, news from LHC TDIS and TCSPM, proposal for a general purpose impedance measurement facility for real accelerator components to be implemented at cryogenic and magnetic field conditions, LHCb VELO update and measurements).

4) Recent instability observations at top energy in the LHC (XavierB):

- 1st one on fill 5650 in not nominal configurations => Seems understood due to much higher impedance introduced by the closer collimators (TCSGs in IR4).

- Fill 5665: puzzling as it happened after 40 min without any modification. BBQ trigged the HEADTAIL. Single nominal bunch became unstable in H with modes 02. Could this be due to some emittance reduction (profile modification) after 40 min? To be followed up.

- Fill 5680 (tune shift with intensity, with 3 bunches of different intensities): Strange tune shift measurements mainly in H at flat top and EOS. To be followed up.

- Fill 5680 and 5681 (instability tests): H instabilities predicted (slightly worse than V) and it is what we saw in measurements. B1 still more critical than B2.

- Fills 5704 and 5710: 1.2E11 p/b was unstable and the loct was increased to 376 A after fill 5710 => OK since then. But threshold should be ~ 180 A in loct => Is it due to the fact the transverse emittances were much smaller than we thought? To be followed up.

- Fill 5710: B2 in FT became unstable. The reduction of the stability diagram due to offset collision in IP2 or 8 may explain the instability, since we seem close to the threshold with 300 A.

- Next step => The most important thing now is to check the transverse emittances (the wire scanners should be operational soon and we should look at the emittances which were measured in the injectors).

5) LIU & ABP-CWG (GiovanniR)

- LIU

- Review of QF SSS vacuum flange shielding design on 24/05/17:
- Series production has to start in June 2017 to fulfill project timeline.

- 3 designs available, all efficient in terms of impedance reduction => Decision to go with the 1\textsuperscript{st} one (extrapolated from present pumping port shielding with sliding fingers => Non-conformities like those found for present shields would be dangerous). Could be implemented in LS2.

- Meeting on SPS injection losses on 12/05/17:
  - Alternative schemes presented for bunch rotation in PS (by AlexL) => Linearising the RF voltage in the 2 steps of bunch rotation (with 80 or 200 MHz cavities), which should reduce the S-shape and associated losses.
  
  - Influence of available RF power and LLRF loops on particles lost out of the bucket at SPS flat bottom still being discussed

- Meeting on LIU beam parameters on 26/05/17 => Requests and priorities for the non-LHC beams should come through the PBC study group, however LIU mandate is to only look at LHC beams and not degrade performance of non-LHC beams.

- ABP-CWG meeting on 24/05/17:
  - Migration to HTCondor expected to be finished according to timelines agreed with IT (90\% of resources presently managed with HTCondor, only 10\% with LSF only until end 2017).
  
  - Summary of the Octave workshop organised by A. Latina at CERN (as alternative to Matlab).
  
  - Presentation on RF-Track (by AndreaL)
    
    - For linacs mainly, with arbitrary RF structures,
    

  - Some highlights from IPAC17 with AnnalisaR’s prize for best student poster!

6) E-cloud (GianniI)

- News from last e-cloud meetings:
  
  - SEY measurements on beam screens extracted from the LHC (exchanged dipole)
    
    - Evidence of conditioning
- SEY distribution rather uniform after air exposure => Further measurements needed

- LeeC’s analysis from instability observed at the beginning of the 2016 scrubbing run (with 288 bunches) => Clear coupled-bunch pattern

- PhilippD presented the implementation of high order multipoles in PyEcloud.

- AnnalisaR presented the results of her extensive simulation campaign on e-cloud driven instabilities in LHC => Impact of e-cloud in dipoles and quadrupoles, damper, chromaticity and octupoles were studied both at 450 GeV and 6.5 TeV.

- Other info:

  - Presentation at HL-LHC/LARP meeting (mainly based on GalinaS’s work):
    - Update on heat loads estimated for the Inner Triplets in all IRs (including the effect of un-coated drifts).
    - Simulation results for the HL-LHC TDIS.
  
  - GianniI visited LBNL (meeting in particular Jean-Luc Vay and Miguel Furman) to discuss possible collaborations on advanced e-cloud simulations.

  - Meeting with TE-VSC team to discuss the upcoming laboratory measurements. In particular we defined the needs from our side in order to be able to use their measurement results to improve our simulation models.

  - We met with the team working on the laser treatment for the HL-LHC (skype call with the UK collaborators) in order to discuss the implications of a non-homogeneous treatment of the beam screens.

  - Proposal to take 50 ns beams in MD was discussed at the latest WP2 meeting and presented at the LSWG on 23 May (if approved the MD might happen in the MD2 block - July).

- Preparation of the LHC scrubbing run:

  - Plans and needs were presented at the LMC on 24 May

  - Present status and plans:

    - Injection of 25 ns trains was setup in Friday night (26 May).

    - 24h scrubbing should take plane on Monday (29 May) to allow for trains of 48b in physics.
- Scrubbing Run will start on the 5 June, when long trains from the SPS should be available.

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

- Status of machines => LEIR:
  - A very good short week for LEIR, which delivered the Xe beam to the PS for the first time, with some advance on the schedule.
  - The longitudinal instabilities have disappeared even at relatively high intensity.
  - LEIR was coupled to the complex on Tuesday 23/5 afternoon and the beam was transferred to the PS in the evening.
  - Difficult setup of the ITE loop. It seems right now the beam position is not yet optimized as the new BPMs installed in the loop are showing immediately saturation on the opposite sign of the particle indicating high secondary electron production. Vacuum has been informed (M.Taborelli) but there are not available values for secondary electron yield due to Xe impact.
  - Difficult orbit setup, apparently scaling knob from Pb to Xe was not enough: it was needed to change B-rho from 0.98 (design report) to 0.966 i.e. 1.5% off. This was found to be the case also for Pb and Ar beams pointing to a lower energy delivered by the Linac3. This is being followed up by LEIR/Linac3 people.
  - Tuned LEIR Q' to -1/-1 and tunes to 1.8/2.72 for H/V planes.
  - Max accumulated intensity is 2.5e10 charges (1 injection, e-cooler on).
  - Observed 200MHz noise on transverse feedback PU 41 on 28/05: not an issue from RF point of view as a low pass filter is applied.
  - PyHEADTAIL (KevinL) => Many interesting instability studies for HL-LHC done by AdrianO, who will report them during the next meeting (on 12/05/17).

5) Miscellaneous

- The next (110th) meeting will take place on Monday 12/06/2017 (in room 6/R-012 at 10:30) => Current agenda:
1) General info and follow-up (EliasM)

2) Reminder on LMCI vs. TMCI (EliasM)

3) HL-LHC coherent stability studies with PyHEADTAIL (AdrianO)

4) LHC scrubbing run (GianniI)

5) 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, 01/06/2017.