Minutes of the HSC section

72nd meeting on Monday 14/03/2016 (14:00-16:00, 6/R-012)

HSC members: Javier Barranco Garcia (JBG), Mario Stefan Beck (MSB), Eleonora Belli (EleoB), Olav Berrig (OB), Nicolo Biancacci (NB), Edoardo Bonanno (EdoB), Xavier Buffat (XB), Lee Robert Carver (LRC), Everton Granemann Souza (EGS), Stefan Eduard Hegglin (SH), Giovanni Iadarola (GI), Kevin Li (KL), Elias Metral (EM), Mauro Migliorati (MM), Adrian Oeftiger (AO), Francesco Paciolla (FP), Tatiana Pieloni (TP), Tatiana Rijoff (TR), Annalisa Romano (AR), Giovanni Rumolo (GR), Benoit Salvant (BS), Michael Schenk (MS), Claudia Tambasco (CT), Alpo Valimaa (AV), Elena Wildner (EW).


1) Newcomers / visitors

- None.

2) Comments on the minutes of the previous 71st meeting + Actions

- None => Look at all the actions.

3) General infos

- SL meeting: nothing special to mention. LINAC2 delivered already 150 mA to the PSB and 1st beam in LHC foreseen for Wednesday 30/03/16.

- Last LSB meeting devoted to non-colliding bunches = Will be presented by YannisP at today’s LHC Background Study Group meeting (https://indico.cern.ch/event/491930/).

- NVIDIA meeting (https://indico.cern.ch/event/506317/): some visitors were there and a short summary will be written by GianniI and MichelJ.

- Impedance and instability workshop to be organized ~ beginning of 2017 will be organized by V. Vaccaro and G. Rumolo.

- May LARP meeting => Possible subjects / results to be presented:
- Update on the possible use of the WBFB (or larger bandwidth of the bunch-by-bunch) to damp instabilities in the LHC?

- Overview of the 200 MHz system pros and cons.

- Update of the beam stability with our latest considerations: effect of linear coupling, etc. Is it really a problem for LHC (and in which conditions?) and could this be a problem for HL-LHC? => Both injection and rest of the cycle.

- Update of the e-cloud studies: tune footprints from dipoles / quadrupoles / triplets etc. and interplay with octupoles and BBLR => First, considerations about the incoherent spread needed for Landau damping.

- Possibly some first analyses of coherent instabilities with e-cloud depending on the advancement of the simulation studies?

- Observed difference of heat load among sectors => What about consequences for HL-LHC if this cannot be understood and mitigated? => Seems none.

- Summary of expected heat load on the beam screens for HL-LHC beam parameters resulting from electron cloud, impedance and synchrotron radiation taking into account the planned modifications and expected SEY evolution.

- Some considerations about the IP1-5 phase advances?

- Summary of impedance and related beam stability studies for the different collimator settings and materials, and finalize the proposal with staged implementation for the optimum impedance reduction of the collimators in collaboration with the collimation team.

- Summary of beam-beam and related beam stability studies => stability limits and recommendations concerning levelling by separation in the high luminosity experiments and in the low/intermediate luminosity experiments.

- Some considerations from impedance team about the new 2-in-1 collimators?

- Any other subjects / results to be presented / discussed / issues to be raised?

- Changes in the new triplets => New shielding etc., i.e. all the work done last year. + the collimator studies next to 11 T dipole.

- LSWG tomorrow:

  - Commissioning / EOF MDs for impedance (LeeC)

  - Scrubbing/e-cloud EoF MDs (GianniI)

  - Beam-beam EoF MDs (ClaudiaT)
4) First assessment of LEIR impedance (TatianaR):  [https://espace.cern.ch/be-dep/ABP/HSC/Meetings/HSC_LEIR_Impedance.pptx](https://espace.cern.ch/be-dep/ABP/HSC/Meetings/HSC_LEIR_Impedance.pptx)

- TatianaR first reviewed the relevant LEIR parameters (at top energy, where she made the measurements), and then compared the measured horizontal and vertical tune shifts (for both a coasting beam and a bunched beam with transverse damper ON and OFF => No significant difference introduced by the damper) with theoretical predictions (assuming Sacherer’s formula) deduced from a first impedance model she built (considering both the indirect space charge and the resistive-wall contribution for 3 types of vacuum chambers: bending magnet - rectangular -, quadrupole - diamond - and others - circular -) using the pyTLWall code from CarloZ and TatianaR.

- Reminder:

  - BetaInj ~ 0.1 and BetaTop ~ 0.37.
  - circumference = 78 m ⇔ ~ 700 ns at Top energy.
  - First unstable betatron lines:
    - (n-Qx)*frev ~ 260 kHz.
    - (n-Qy)*frev ~ 400 kHz.
  - Note that at injection, at the Beta is ~ 4 times smaller, the first unstable betatron line is at ~ 100 kHz.
  - Measured chromas used ~ -1 in both planes.
  - h=2.

- Summary:

  - The measured slope of the horizontal tune shift is ~ 2 times smaller than the calculated one and the measured slope of the vertical tune shift is less than 2 times bigger than the calculated one, which is already a very good agreement with this first impedance model.
  - The most important contribution to the tune shift is given from the indirect space charge.
- The contributions of the round chamber and the bending magnets are more important than the contribution of the quadrupole.

=> To be continued.

5) Discussion about the LHC injector MDs we would like to propose for 2016, linked to coherent effects (all people involved)

- PS nTOF => Discussions (paper) about some beam parameters for the nTOF spallation target (in view of the nTOF target replacement during LS2) => Important to continue and understand the instability at transition (both for LHC beam and nTOF).

- TMCI studies in the SPS: i) without and with SC; ii) without and with damper. To be compared to predictions. To be done in // to TMCI studies in the LHC: i) without and with SC at injection; ii) without and with damper. To be compared to predictions.

- SPS imped meas. vs chroma => To be presented by MarioB at some point.

- GiovanniR mentioned some nice meas. done by EiriK at Diamond showing no effect of the transverse damper for TMCI close to chroma ~ 0 (and helping for negative and positive chromas) => To be followed up.

- Are there some LHC items which could be studied in the LHC injectors => Q”? linear coupling effect? Etc.

6) Miscellaneous

- The next (73rd) meeting will take place on Monday 21/03/2016 (in room 6/R-012 from 14:00 till 16:00) => Agenda:

  1) General info and follow-up (EliasM)
  2) Fast Beam Ion Instability (FBII) studies (LottaM)
  3) Update of LHC linear coupling studies to prepare tomorrow's LBOC talk (LeeC)
  4) HL-LHC RF fingers: simulations and measurements (BenoitS and NicoloB)
  5) HL-LHC heat loads and WP2 actions (EliasM)

- 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, 18/03/2016.