Minutes of the HSC section

3rd meeting on Wednesday 29/01/2014 (09:00, 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), Adriano Garonna (AG), Meghan McAteer (MM), Nicolas Mounet (NM), Carlo Zannini (CZ), Nicolo Biancacci (NB), Xavier Buffat (XB), Alexander Huschauer (AH), Giovanni Iadarola (GI), Adrian Oeftiger (AO), Meghan McAteer (SP), Tatiana Rijoff (TR), Magdalena Kowalska (MK), Andrea Passarelli (AP), Vincenzo Forte (VF), Danilo Banfi (DB), Xavier Barranco (JB), Joseph Kuczerowski (JK).


1) Newcomers / visitors

- None.

2) Comments on the minutes of the previous 2nd meeting + Actions

- Proposition to postpone the talk from KevinL, which could not be given last week due to time constraint (sorry again…), to 26/02/14.


3) General infos

- No particular comment from anyone.

- SL meeting:
  - No SLM last week.

- LPL (LHC Performance Limitations) review summary => Thanks to those who sent me already some comments, deadline is Friday and then I will release it next week.

- Next steps:
- Special HSC meeting devoted to the follow-up of the LHC Performance Limitations (LPL) review during run I to prepare the LHC re-start in 2015 on 05/03/14 (from 09:00 till 12:30) => See Action 1 below:

  - Update on the single-beam instabilities and impedance related MDs (NicolasM).

  - Update on "snow-flakes" instabilities and instabilities during adjust (XavierB).

  - Update on end-of-squeeze instabilities (TatianaP).

  - Update on electron cloud effects (GiovanniR).

  - Update on instabilities at injection (KevinL).

  - Global discussion about our recommendations for the LHC restart in 2015 to be presented at the LBOC on 11/03/2014 (see below).

  - Talk to be given at the LBOC on 11/03/2014 (see Action 2 below) with our recommendations and answers to the questions raised from LBOC (copy/paste below):

    - Stability – beam-beam (Elias et al):

      - What is the required beam-beam separation? 12 s?

      - Do we have to go in collision during the squeeze for 25 ns and for 50 ns to stabilize the beam?

      - Can we go in collision in ALICE only as a back-up for 25 ns?

      - Which polarity of the octupoles do we need? Which strength?

      - Which chromaticity?

      - In which sequence should we go in collision?

    - Ecloud (Giovanni et al.)

      - New cryo instrumentation for localized heat load measurements (quadrupoles/dipoles) in the arcs.

      - Vacuum instrumentation for electron cloud measurements in warm sections.

      - Solenoids for e-cloud. MKIs?
- Doublet beams:
  - Interlocked BPMs. Possible solutions.
  - Cryogenic heat load display, on- and offline => Add also the stable-phase display as mentioned by GiovanniR during the LBOC meeting.

- Measurements needed?
  - Which measurements should we make during start-up?
    - Q’, non-linear Q’ (+- octupoles), impedances, detunings...
  - Which measurements should we make during the intensity ramp-up with 50 ns?

- Other info given at the LBOC meeting:
  - News about LHC transverse emittance growth with the correct betatron functions during the ramp => Seems that emittance growth in H-plane during ramp is probably mainly due to IBS.
  - There will be a kind of Evian event in June.
  - There will be a kind of Chamonix event in September.
  - There will be a sector test in 2014 => Current date is first week-end of November 1-3.11. In case of delay, shift to >= 20/11.

- Task2.4 meeting last week => First estimates of beam stability for HL-LHC => Some interesting results and plan for the future.

- Beam-beam meeting:
  - Sixtrack update => Many issues solved and now everything seems to be fine => Need to document all this and answer there clearly to all the questions raised in the past (what about the sign of the crossing angle, etc.?).
  - Stability diagrams with both octupoles and beam-beam for 2012 and 2015 => Much better to have LOF > 0 for 2015. What about 2011? To be continued and finalize during the HSC meeting on 05/03/2014.

- Impedance meeting:
  - PS dummy spectrum => Finished and official email to be sent to MTE’s project leader.
- A lot of work on UA9 goniometer => Some interesting cases still to be better understood.

  - Resonances just below the pipe cut-off, effect of a thin piece of metal not far from the beam, etc.

  - Huge improvement in the SPS impedance model including transitions as now we can reproduce the vertical coherent tune (within few percent!). The horizontal tune shift was already well reproduced.

  - Many (important) measurements planned for the near future.

- FCC-FHI meeting => To discuss the hadrons injectors only and in particular a HEB (High Energy Booster) which is currently discussed to be placed either in the SPS, or in the LHC or in the FCC itself.

- Comment/request from ElenaB => 2 presentations should be given in the 2nd part of March at the PSB LIU meetings to discuss the PSB impedance model and the related instabilities/MDs (See Action 3 below).

- Summary of the SOLEIL workshop => On Friday by BenoitS and GiovanniR, info sent: http://clic-meeting.web.cern.ch/clic-meeting/.

- Info already sent:
  - 4th Phd School on Complex Systems in Athens.
  - IPAC’14 guidelines.

- Important point that we should not forget => When/where do we do our usual ski outing day (see Action 4 below)?


- Beam time needed to develop full potential of hadron therapy: radiobiology, fragmentation of ions, dosimetry, testing and developing of detectors for imaging, etc.

- Brainstorming meeting in 2012 (> 200 experts from > 20 countries) in support of dedicated research facility at CERN (general workshop coming):

  - Energy range matches that of clinical centers (max 6.7 Tm, i.e. 440 MeV/u for C).

  - Existing accelerator to be maintained for LHC, but not used all the time.

  - Adjacent Hall (1500 m2).
LEIR is a good candidate to provide the required beam time.

- However:
  - Constraint: maintain the current operational performance for LHC and PS/SPS physics operation.
  - Wide range of ions requested: from proton to Neon => High flexibility required.
  - New hardware and modifications to existing hardware are needed => New dedicated source and RFQ are required for flexibility, faster switching between species and operation during LHC run.

- A new dedicated front-end is proposed (ECR source - SuperNanogan, permanent magnet quite compact -, H/H2, He, C, N, O and Ne which have been already extracted and B and Li under development with Helmholtz-Berlin) and the feasibility has been proven by tracking with most critical beam parameters.

- A resonant slow extraction (1/3) allows to produce 1-10 s spills.

- Two resonance driving mechanisms have been considered:
  - Quadrupole-driven, which is easy to implement.
  - RF-KO (i.e. with transverse noise via kicker and we extract via amplitude.), which provides better beam quality.

- Extraction is possible with minimal new hardware but the critical point is the electrostatic septum (very limited longitudinal space and field strength limited by vacuum requirements for Pb operation).

- 2 experimental beam lines are foreseen:
  - Horizontal beam line up to maximum energy and vertical beam line up to 2.6 Tm (75 MeV/u C).
  - Pencil beam 5-10 mm FWHM and broad beam 5x5 cm2 considered.
  - 4 bending magnets (max 1.6 T, ± 40 mm gap) and 12 quadrupoles (max 23 T/m, max 40 mm radius) in total.

- Summary:
  - No major problem found for the slow extraction. Do we need to put a roof due to potential RP issue?
  - Until now the MADX-PTC tracking has been done in static, i.e. all the elements were already fully powered. The next step would be to redo all this study dynamically, i.e.
from 0 to full current of the different elements => PTC-ORBIT could be an option.

- Front-end
  - Light ions source chosen with methods for Hydrogen, Helium, Carbon, Oxygen, Neon ready to go.
  - Experiments to develop Boron and Lithium beams.
  - RFQ design in progress.

- Slow extraction
  - Feasibility of both quadrupole-driven and RF-KO extraction proven.
  - Minimal impact on LEIR and possibility to reuse spare devices

- Experimental beam lines
  - First proposal for vertical and horizontal beam line completed.
  - Alternative solutions under investigation: downwards vertical beam line, octupole transverse spreading, scanning system for horizontal beam line.
  - Biolabs available for experimental groups (cell culture in situ, analysis, imaging, etc.).

5) Actions to be taken for the next meeting

- New:
  - **Action 1 (NicolasM, XavierB, TatianaP, GiovanniR, KevinL and all the others for comments/suggestions):** Prepare the special HSC meeting (on 05/03/14, from 09:00 till 12:30) devoted to the follow-up of the LHC Performance Limitations (LPL) review during run I to organize the LHC re-start in 2015.

  - **Action 2 (EliasM et al. EliasM will not be at CERN for this talk):** Talk to be given at the LBOC on 11/03/2014 with our recommendations and answers to the questions raised from LBOC concerning the LHC restart in 2015.

  - **Action 3 (CarloZ, KevinL and NicolasM):** Give 2 presentations in the 2nd part of March at the PSB LIU meetings to discuss the PSB impedance model and the related instabilities/MDs.

  - **Action 4 (GiovanniR, BenoitS and EliasM – and others?):** When/where do we do our usual ski outing day?
6) Miscellaneous

- The next (4th) meeting will take place on 19/02/2014 => Agenda:

  1) General info and follow-up (EliasM)

  2) Reports of the 4 WGs (by the WG leader or replacement) => Plan, activities, deadlines, issues, etc.: SC, IMP, BB and EC

  3) AOB

- 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, 01/02/2014.