Minutes of the HL-LHC WP2 Task 2.4

11th (VIDYO) meeting on Wednesday 30/04/2014 (11:00-12:30, 6/R-018)

Task 2.4 members: Alexey Burov (AB), Alessandro Drago (AD), Alessandro Gallo (AG), Andrea Mostacci (AM), Alessandro Vivoli (AV), Benoit Salvant (BS), Bruno Spataro (BrunoS), David Alesini (DA), Deepa Angal-kalinin (DAK), Elias Metral (EM), Elena Shaposhnikova (ES), Fabio Marcellini (FM), Fritz Caspers (FC), Frank Zimmermann (FZ), Gianluigi Arduini (GA), Giovanni Rumolo (GR), Hugo Alistair Day (HAD), John Jowett (JJ), Kevin Li (KL), Luigi Palumbo (LP), Mauro Migliorati (MM), Michel Martini (MM), Mikhail Zobov (MZ), Nicolas Mounet (NM), Nicolo Biancacci (NB), Oliver Boine-Frankenheim (OBF), Olga Zagorodnova (OZ), Oscar Frasciello (OF), Paul Goergen (PG), Rainer Wanzenberg (RW), Uwe Niedermayer (UN), Wolfgang Hofle (WH).

Present/Excused: AB, AD, AG, AM, AV, BS, BrunoS, DA, DAK, **EM**, ES, FM, FC, FZ, GA, GR, HAD, JJ, KL, LP, MM, MichelM, **MZ**, NM, NB, OBF, OZ, **OF**, PG, RW, UN, WH, **Giovanni Iadarola, Juan Esteban Muller**.

1) General information (EliasM):

- Nothing particular. Reminder that EliasM will have to send the milestone report to GianluigiA on 16/05/20144, which is quite soon. If anybody wants to present something, has any comment, suggestion, etc., please do not hesitate. After this meeting we should try and answer to the remaining actions: http://emetral.web.cern.ch/emetral/Task2point4OfHLLHCWP2/ListOfActions.htm.

- The minutes of the last (10th) meeting from 16/04/2014 have not been released yet => Should be done, together with the minutes of today's meeting, before the next meeting next week…

- Last week, the impedance workshop took place => See https://indico.cern.ch/event/287930/.

2) Follow-up of e-cloud effects in HL-LHC (Giovanni Iadarola): https://indico.cern.ch/event/310706/contribution/1/material/slides/0.pptx

- The talk (to summarize the status if this activity and discuss the next steps) was divided into 3 parts

  - Arc main magnets

- Inner triplets => Already discussed here.

- Matching sections – preliminary considerations

- Studies for the arc main magnets

  - Non-monotonic heat load vs. bunch intensity anymore for small SEY (~ 1.4.) => Seen both on dipoles and quadrupoles (more stricking)

    - Reminder: The e- energy for the max SEY is ~ 300 eV for the LHC. Assumed material: copper (coating).

    - The underlying mechanism to explain the non-monotonic behavior is that when the SEY decreases, the energy window for multipacting becomes narrower and for high bunch intensity the e- spectrum drifts to higher energies.

    => Provided that we manage to access a low SEY regime, increased bunch intensity should be acceptable for heat load, effect on the beam still to be assessed.

  - 200 MHz option

    - Longer bunches are better for e-cloud.

    - The impact of bunch length on e-cloud could be studied experimentally during Run 2 (e.g. to mitigate the degradation at low energy).

  - 8b+4e fallback solution

    - Reduces a lot the heat-load.

    => Backup scheme in case safe operation with 25 ns beam is hampered by e-cloud (still 50% more bunches wrt 50 ns).

    - Note that the effectiveness of this scheme will have to be confirmed during Run 2.

  - Doublet scrubbing beam.

    - To operate with 25 ns beams (~2800b) in 2015 it will be mandatory to achieve lower values in SEY compared to what was achieved in Run 1 => This “scrubbing beam” will be used for that and it is already in the plan (followed up at the LBOC).

- Studies for the inner triplets

  - Already done for IP1 and IP5. Scalings were done for IP4 and IP8 with the present triplets installed.

  - Summary

- Higher heat-load for positions, which are far away from BBLR and most critical in Q1a because of the reduced aperture.

- Factor ~ 3 higher heat load for Hilumi triplets => e-cloud suppression to be obtained by using low SEY coatings and/or clearing electrodes.

- Studies for the matching sections

- For the present LHC and HL-LHC, there are 6 kinds of beam screens: 4 old (BSArc, BS1, BS2 and BSD2) + 2 new (BSHL and BSHLD2).

- Not huge number but what is huge is the # of configurations which need to considered (magnetic field, gradient, beam size, beam position, energy ramp, squeeze, separation, beta* leveling, etc.) => We need to go for parametric studies to assess which of these dependencies strongly impact the e-cloud build-up.

- Beam size and Bfield have non-negligible effects even if relatively small => Next step: try and disentangle the 2.

- Have to study also the effect of the beam position.

- Question from MikhailZ: have you studied the voltage needed to suppress the e-cloud? GiovanniI answered that it was not done yet. It could be important for the design of clearing electrodes => GiovanniI and MikhailZ will follow this up together.

3) Impedance comparison between analytical estimates, CST and GdFidL (Oscar Frasciello):
https://indico.cern.ch/event/310706/contribution/2/material/slides/0.pdf

- OscarF made a comparison between analytical estimates (using the Mode Matching - MM - approach of NicoloB), CST and GdFidL for the simple case of a toroidal pill-box filled with ferrite (TT2-11R):

- CST and MM are in perfect agreement.

- However, GdFidL does not agree. Warner Bruns has been informed. To be followed up.

4) Next meeting

- The next (12th) VIDYO meeting will take place on Wednesday 07/05/2014 from 11:00 to 12:30 in the room 6/R-018 for the CERN people. The agenda is

1) General information (EliasM)

2) Answers to the remaining actions (http://emetral.web.cern.ch/emetral/Task2point4OfHLLHCWP2/ListOfActions.htm), knowing that EliasM will have to send the milestone report to GianluigiA on 16/05/20144)

3) AOB (EliasM)

Minutes by EliasM, 05/05/2014.