Minutes of the HL-LHC WP2 Task 2.4

12th (VIDYO) meeting on Wednesday 07/05/2014 (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.

2) Follow-up of the impedance comparison between analytical estimates, CST and GdFidL (Oscar Frasciello): https://indico.cern.ch/event/310707/contribution/4/material/slides/0.pdf

- OscarF presented an update of their studies with GdFidL.

- A new plot is shown in slide 2, comparing the TT2-111R ferrite experimental data vs. GdFidL best fit functions provided by W. Bruns:

  - As can be seen, the 1st fit was not that good and lead to the disagreement discussed last week.

  - But, the new fit is much better and with this new fit, GdFidL is very close to the MMM and CST results (slide 4).

  - Conclusion: it seems that there is nothing pathological with GdFidL and that the problem is the way the fit of the material properties is

done.

- As a next step, one could try and see what MMM and CST give with the first fit used by GdFidL to see if one recovers GdFidL results.

- MikhailZ added that for the LHC collimators the same results are obtained (for both fits) and that the issue with the low frequency modes is still there.

3) Answers to the remaining actions (NicolasM): https://indico.cern.ch/event/310707/contribution/0/material/slides/0.pdf

- NicolasM presented and update on the intensity limitations from the HL-LHC transverse impedance.

- Effect of SLAC Crab Cavities (CC)

  - The CC are modeled as a set of HOMs (see talk from BenoitS at the HiLumi-LHC/LARP Crab Cavity System External Review at BNL, 05-06/05/2014: https://indico.bnl.gov/conferenceDisplay.py?confId=728).

  - Huge peaks are observed around ~ 1 GHz.

  - These peaks disappear if we put (artificially) Q = 1 (keeping the same R/Q) for all the HOMs but the transverse (horizontal dipolar) impedance is increased by ~ 10-15%. The effect is even more significant in the longitudinal plane, where beam stability should be studied.

  - In the transverse plane, the beam stability has been studied vs. Q' for both a single bunch and for the 25 ns beam (both in the presence of a 50-turn transverse damper, 15E11 p/b) => A very significant (detrimental) effect is observed in both cases, and the effect is much larger for the 25 ns multi-bunch beam => Very critical!

- Effect of Molybdenum on instabilities

  - The last time no effect was observed as it was hidden by the too big CC impedances.

  - This time it has been studied without CC => A clear impact (beneficial effect) can be observed on the total dipolar vertical impedance with both Mo or MoC.

  - Looking at the beam stability (single-bunch and multi-bunch growth rates, 1.5E11 p/b, 50-turn damper, etc.), Mo or MoC helps significantly. Almost no difference between 5 microm and 50 microm of Mo coating.

  - Note that without damper, Mo or MoC actually degrade the situation

for positive chromaticities.

=> 5 microm of Mo coating seems to be the best choice.

- Updated TMCI intensity thresholds at both top and injection energies

  - Top energy (without damper, Q' = 0, etc.):

    - The TMCI intensity threshold with CC and still CFC collimators is close to 3.8E11 p/b (i.e. close to the LHC 2012 case).

    - The best scenario case (i.e. no CC and Mo-coated collimators) gives and intensity threshold of more than 6E11 p/b.

  - Injection energy (without damper, Q' = 0, etc.):

    - The intensity threshold is ~ 5E11 p/b for the worst case scenario.

- Stability limits at high chromaticity (as used in the 2nd part of LHC Run 1 in 2012 => Q' ~ 15 units) obtained (in relative) from LHC 2012 worst instabilities observed:

  - 25 ns beam with damper (50-turn):

    - We cannot stabilize the HL-LHC beams in the case of the worst scenario (CC + CFC collimators).

    - Stability can be reached with Mo-coated collimators.

  - 25 ns beam without damper:

    - We cannot stabilize the HL-LHC beams for any scenario (if the LHC 2012 instabilities were coupled-bunch).

    - Mo-coated collimators make the situation even worse.

4) Next meeting

- The next (13th) VIDYO meeting will take place on Wednesday 14/05/2014 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) => Update on transverse beam stability in the presence of 2 RF systems (KevinL)

3) AOB (EliasM)

Minutes by EliasM, 07/05/2014.