

## Minutes of the HL-LHC WP2 Task 2.4

**7<sup>th</sup> (VIDYO) meeting on Wednesday 26/02/2014  
(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), 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, OBF, OZ, OF, PG, RW, UN, WH, **Juan Esteban Muller, Giovanni Iadarola.**

### 1) General information (EliasM):

- Any comment from last meeting? Many actions (ongoing).
- Current plan for the future meetings:
  - Today will be devoted to 1) a review of the e-cloud estimates in the HL-LHC triplets / D1 and 2) impedance considerations for the design of the triplet/D1 beam screen as there is a TECHNICAL MEETING ON VACUUM FOR HI-LUMI LHC, which will take place next Wednesday: <https://indico.cern.ch/event/304605/>.
  - On 26-03-2014: HL-LHC (and LHC) longitudinal collective effects with 1 RF system (400 MHz) or 2 RF systems (400 + 800 or 400 + 200) by Elena Shaposhnikova and Juan Esteban Muller.
  - In April: Follow-up of e-cloud effects in HL-LHC (Giovanni Iadarola).
- Issue with Vidyo (sorry for the time lost...) => Reminder for the future (for us/me):
  - Need the equipment by Riccardo => He ordered a 2<sup>nd</sup> one.
  - Need to log on the PC locally to be able to share the screen.

**2) Review of the e-cloud estimates in the HL-LHC triplets / D1 by GiovanniR:**  
<https://indico.cern.ch/event/303742/contribution/1/material/slides/1.pdf>

- Reminder:
  - IP2 and IP8 have already D1 included in the cryostat.
  - IP1 and IP5 do not have D1 included in the cryostat for LHC but it will be included for HiLumi.
- The real geometries have been used for both LHC and HL-LHC => Concentrate on results for the new triplets (with octagonal shape).
- New e-cloud build-up regime for HL-LHC (compared to LHC) => Non only diagonal but thicker stripes along field lines farther from the centre of the chamber.
- IP1 and IP5 are not exchangeable with respect to e-cloud simulations due to different Xangles and therefore different beam positions.
- Distribution of heat load => Values in D1 are comparable or higher than values in the quads.
- Q1 has highest heat load due to smallest aperture.
- Reminder: same pattern was also obtained for LHC.
- Total heat load per element
  - Similar thresholds for quads and D1.
  - Values in D1 higher than values in the quads for high SEY values.
- Total heat load on the triplet beam screen
  - For the same SEY, similar energy of multipacting e- and larger number of impacting e- => Total heat load about 3 times larger.
  - Reminder on the present limit: 250 W for the triplets.
  - e-cloud suppression can be obtained using low SEY coatings and/or clearing electrodes => To keep the heat loads within the cooling capacity.
- Inner triplets IP2 and IP8 + D1
  - Data from 2012 do not clearly show the contribution of D1.
  - Funny behavior in IP8. It is true that there is an involved gymnastics with a tilted angle but this is when we go in collision. Is there some regulation? How precise are the measurements? => Check with the

experts.

- More simulations needed.

- Pure scaling with bunch population indicates that HL-LHC beams will lead to a heat load 3 times larger in the beam screen of IP2 and IP8 triplets.

- Seems that for IP2 and 8, the main option is to coat as it is small and already existing.

- Possible future MD studies: Study the effect of the longitudinal shift in the e-cloud build-up along the triplets, as there seems to be a clear effect in the simulations.

### **3) Impedance considerations for the design of the triplet/D1 beam screen by NicolasM:**

<https://indico.cern.ch/event/303742/contribution/2/material/slides/0.pdf>

- Update on the contribution of both IP1 and 5 with 15 cm beta\* to the total impedance budget => Conclusion: not 10% anymore as mentioned in the past from very first estimates => Much smaller now, i.e. much below the 1% level above ~ 100 kHz.

- Question from GianluigiA about the effect of the 2 beams => NicolasM will include this in his slides for next week's meeting, but it should be a small effect.

### **4) Next meeting**

- The next (8th) VIDYO meeting will take place on Wednesday 26/03/2014 from 11:00 to 12:30 in the room 6/R-018 for the CERN people. The agenda is

- 1) General information (EliasM)

- 2) HL-LHC (and LHC) longitudinal collective effects with 1 RF system (400 MHz) or 2 RF systems (400 + 800 or 400 + 200) by Elena Shaposhnikova and Juan Esteban Muller

- 3) Test simulations of TT2-111R lossy dispersive material properties by Oscar Frasciello

- 4) AOB (EliasM)

*Minutes by EliasM, 19/03/2014.*