e-cloud action review

G. Iadarola
The electron cloud **instability threshold based on estimates of the electron cloud density in the main dipoles/quadrupoles** should be made for the nominal parameters. Limit of stability for different values of the SEY.

Study of **coupled bunch stability** in the arcs and IRs: Action Gianni. This should include the stability at injection and the parameter phase space (i.e. optimum settings octupoles/chromaticity to stabilize the beam with acceptable DA)

– See presentation by L. Mether on 10/12/2019 (https://indico.cern.ch/event/863723/). Effect of quadrupoles to be introduced.

**People involved:** L. Mether, L. Sabato, G. Iadarola

- **Single bunch:** a note has been published, covering numerical convergence studies and dependence on beam/machine parameters ([CERN-ACC-NOTE-2020-0050](https://indico.cern.ch/event/863723/)).

- **Coupled bunch:** further simulations have been performed, mainly to study the bunch-by-bunch tune shifts. Simulations including the quadrupoles are planned. **An update could be given ~end-November**
The electron cloud instability threshold resulting by electron cloud in the triplet/matching sections should be estimated for different coating scenarios. Action: Gianni – Deadline to be defined once simulation of the arcs is completed.

People involved: G. Iadarola, L. Mether, S. Johannesson

- Studies for the arcs are now completed (note published: [CERN-ACC-NOTE-2020-0050](#))
- The impact of triplets and matching sections could be evaluated with the newly developed analytical approach. It could be done by Spring 2021.
Study of **incoherent effects in the presence of electron clouds** in the LHC (is the asymmetry in lifetime $B_1/B_2$ relate to electron cloud effects in the triplets and in particular to the asymmetry in heat load observed left/right of point 5): Action: Gianni – Ongoing. See presentation on 10/12/2019 (https://indico.cern.ch/event/863723/) by K. Paraschou and on 7/7/2020 (https://indico.cern.ch/event/924097/).

**People involved:** K. Paraschou, G. Iadarola, M. Schwinzerl, R. De Maria

**Status:**
- **Work is progressing well:** code development in sixtracklib is practically finalized.
- **First full-scale studies have been performed on GPU** (dipoles only). The effect of quadrupoles is being included.
- An update could be presented in **November**.

From WP2 meeting on 21/4/2020 (https://indico.cern.ch/event/903324/) Estimate the **tune shift** resulting from electron cloud to be added to the shift resulting from impedance. Action: Gianni

**People involved:** L. Mether, G. Iadarola

**Status:**
- Work is ongoing, results could be presented in **November**.
<table>
<thead>
<tr>
<th>Action</th>
<th>e-cloud buildup in <strong>crab cavities</strong></th>
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| Status: | **People involved:** L. Giacomel, G. Iadarola  
• **Work is progressing well:** fruitful collaboration with LBNL  
• An update is planned on **10 November** |

| Action | **Y-chambers** in IR1/2/5/8 (see meeting on 7/3/2017 - [https://indico.cern.ch/event/617854/](https://indico.cern.ch/event/617854/) )  
– Information from WP12 needed concerning coating and **in general information concerning the dimensions, surface of all vacuum chambers**. This information should be added in the Layout DB and then studied. Action on-hold pending clarification with WP12. |
|--------|-----------------------------------|
| Status: | **People involved:** G. Iadarola  
• TE-VSC confirmed that **all Y-chambers are NEG coated**.  
• The status of the coating information in the layout database could be checked with TE-VSC - **should we ask them for a presentation at some point?** |
Understanding of the **origin of the difference in heat load among sectors**. Long term action.

**Status:**

- The heat load differences were traced back to the presence of CuO on the surface.
- Work is ongoing within the Heat Load Task force to understand the formation of this oxide and to identify methods for its removal.

See presentation on 10/12/2019 (https://indico.cern.ch/event/863723/): We cannot currently **simulate gas densities above** $10^{20}$ m$^{-3}$, as the breakdown occurs after only a few bunch passages.

- Gianluigi suggested **reaching out to colleagues who perform similar simulations** or have relevant experience to see if they face similar limitations of the PIC method and if there are any ideas to overcome them (Action: Lotta longer term).
- Elias asked how the situation would change with a **solenoidal external field**. Lotta commented adding an external field can be tried. (Action: Lotta – longer term).

**People involved:** L. Mether, G. Iadarola

**Status:**

- We could bring up the topic in a meeting with J.L. Vay
- Simulations with the **solenoid** are done, could be presented in **November**