Electron cloud coherent and incoherent effects - Status on 13/08/2020

1. 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.
    1. 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.

       Further coupled-bunch simulations have been performed (mainly to investigate the tune shifts). Simulations including the quadrupoles are planned. Could be presented ~end-November 2020.

    2. 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**

       Studies for the arcs are well advanced: a note on simulations has been prepared by Luca and a new semi-analytical approach has been developed by Gianni. The impact of triplets and matching sections could be evaluated with the analytical approach, to check whether it's at all relevant. 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 B1/B2 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/).

       Work is progressing well, code development is practically finalized. first full-scale studies are being performed on GPU. A update could be given very soon if needed.

2. **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**

   Work is ongoing, using both single-bunch and coupled bunch tools (Gianni and Lotta). Could be presented ~end-November.

Electron cloud effects – Build-up - Status on 13/08/2020.

Electron cloud build-up:

- In the crab cavities. **End of 2020**

  The work is progressing well, in collaboration with LBNL. An update at the WP2 meeting is planned for November.

- Y-chambers in IR1/2/5/8 (see meeting on 7/3/2017 - https://indico.cern.ch/event/617854/) – Information from WP12 needed concerning coating and in general information concerning the dimensions, surface of all vacuum chamber. This information should be added in the Layout DB and then studied. **Action on-hold pending clarification with WP12.**

  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 (Vincent?).

- Understanding of the origin of the difference in heat load among sectors. **Long term action.**

  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 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).**

  - Simulations with the solenoid are done, could be presented soon
  - Discussions with J.L. Vay will take place when Lorenzo is back (October) and we could bring up also our experience with Lotta's simulations.