# Electron cloud meeting #77, 04/12/2020 (indico)

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## **Benchmarking surface conditioning** (M. Himmerlich)

Marcel presented an update on surface treatments for e-cloud mitigation:

- The two approaches pursued at CERN are coating with amorphous carbon and laser treatment (LESS).
- The laser ablation presents a significant risk of generating particles, which could trigger sudden beam losses (UFOs).
- To avoid this issue low-power treatments can be adopted. This approach shows better characteristics in terms of UFOs and impedance, but results in a significantly higher SEY. Nevertheless the surface shows faster conditioning compared to the untreated copper surface.
- A similar behavior is observed also in amorphous carbon coatings performed in the presence of cryosorbers.
- As a path for future development, it is proposed to target surfaces that show an $SEY_{max}$ of 1.5 after the treatment, and condition to $SEY_{max}$ smaller than 1.0 with an electron dose smaller that $5\times10^{-4}$ C/mm$^2$
- The proposed strategy is endorsed by the beam dynamics team, based on the fact that the lower initial SEY would facilitate the initial phases of a scrubbing run in terms of beam quality, and that the mentioned dose can be accumulated in relatively short scrubbing period.
- It is recommended to confirm that the conditioning process for the treated surface is not hindered by chemical modifications, like the formation of CuO observed in the LHC.

## **Application of Vlasov method to instabilities driven by e-cloud in the SPS dipoles** (L. Mether)

Lotta presented a study on beam stability for the SPS, using the newly developed Vlasov method:

- As observed for the LHC with the same method, instabilities are found to be triggered by transverse mode coupling (TMCI).
- The effect of the bunch intensity was studied:
  - Increasing the bunch intensity leads to lower instability thresholds;
  - Results are consistent with past PIC studies.
- The coherent tune shift below the instability threshold can be estimated with the Vlasov model:
  - A cancellation between the detuning from dipolar and quadrupolar forces occurs.

    - The tune shifts are very similar for the two studied bunch intensities.
- The effect of the synchrotron tune was also studied. Decreasing the synchrotron tune leads to a lower instability threshold. This is due to the synchrotron sidebands becoming closer, thus facilitating the coupling between modes.