Contribution ID: **231** Type: **not specified**

Recent development in Laser ablation surface engineering for reduction of secondary electron yield

Tuesday 10 April 2018 17:59 (1 minute)

Developing a surface with low Secondary Electron Yield (SEY) is one of the principal methods of mitigating the beam-induced electron multipacting and electron cloud in high-energy charged particle accelerators. Since the wall material, surface chemistry, topography and electron energy are the parameters that influence the SEY, common mitigation mechanisms are based on engineering the above parameters. Recently ASTeC has demonstrated that nano- and microstructures engineered on Cu, Al and Stainless steel surface reduces SEY to less than 1. Such structures can be readily produced by nano- and sub-nanosecond pulsed laser [1]. SEY can be further reduced to an even lower value by bake-out and/or photon and/or electron bombardment [2]. A systematic analysis of surface composition and chemistry (using XPS), the surface topography (using SEM), and SEY measurements with primary electron energies ranging from 10 to 2000 eV, surface impedance and generated particles size is reported and correlated to the laser treatment conditions.

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Session Classification: Poster session

Track Classification: EuroCirCol