

Effect of synchrotron radiation and chamber properties on LHC electron-cloud heat load

Effects of the sawtooth and its orientation

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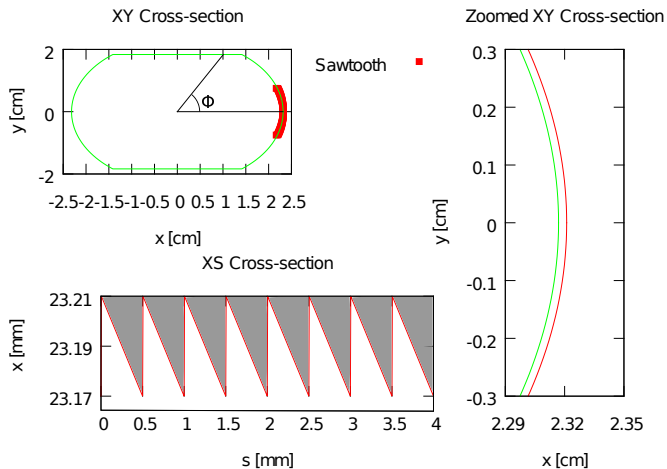
Section 1

Synrad3D

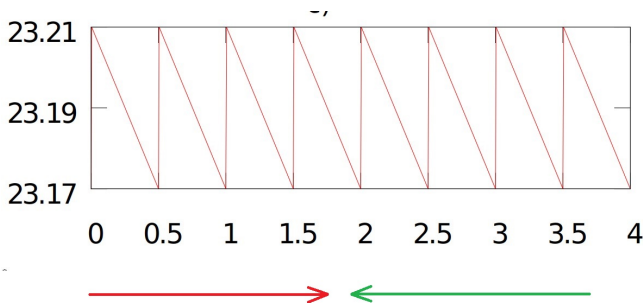
Key parameters

- Vacuum chamber
 - Material - 10 nm C over Cu
 - Surface roughness - $\sigma = 50$ nm
- Lattice - Taken from <http://lhc-optics.web.cern.ch/>
- Geometry

Geometry

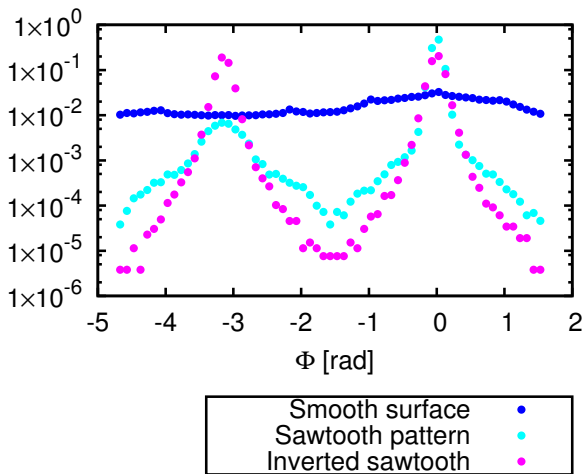


Geometry

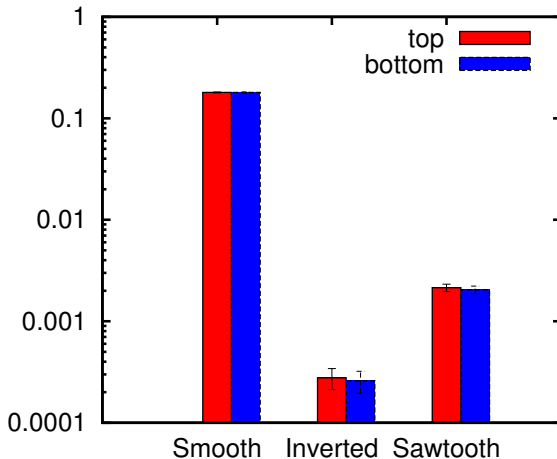


Green is a beam seeing a correct orientation.
Red is a beam seeing an inverted orientation.

Normalized photon absorption functions



Normalized absorption at top and bottom of the chamber



Section 2

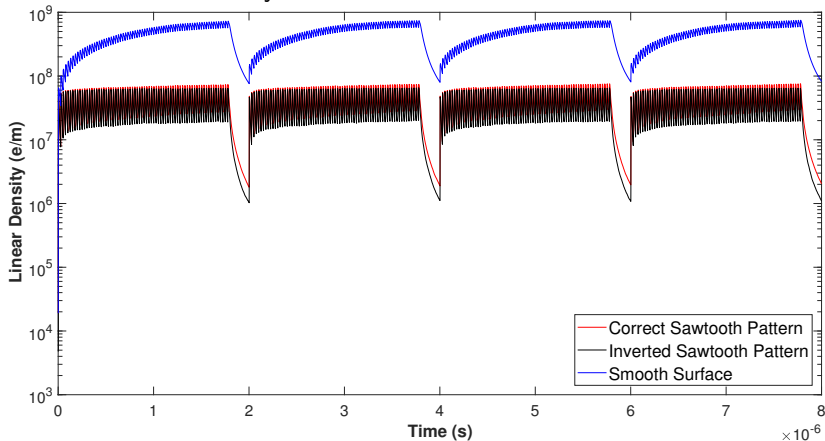
PyECLLOUD

Key parameters

- SEY values from 1.0 to 1.7 in 0.1 steps.
- Proton Beam Energy of 6.5 TeV
- Vacuum chamber used is rectellipse
- Filling pattern, repeated 4 times
 - 72 particle-filled bunches
 - 8 empty bunches
- Bunch spacing of 25 ns

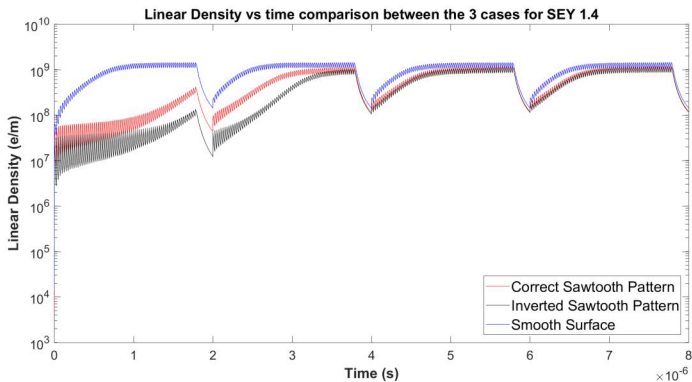
Linear Density

Electron linear density for a $SEY = 1.3$



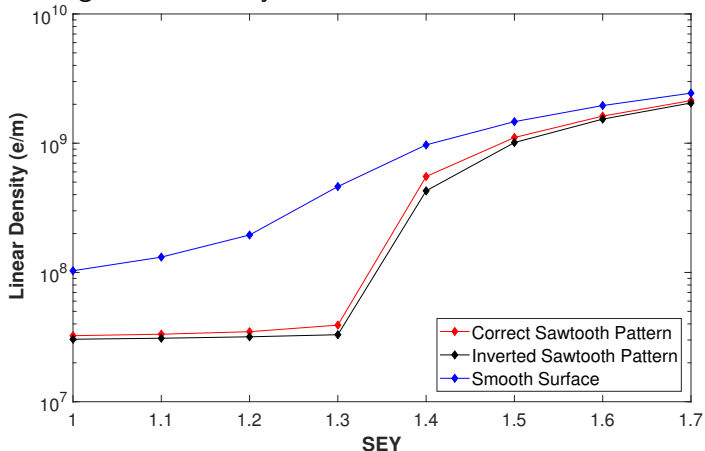
Linear Density

Electron linear density for a $SEY = 1.4$



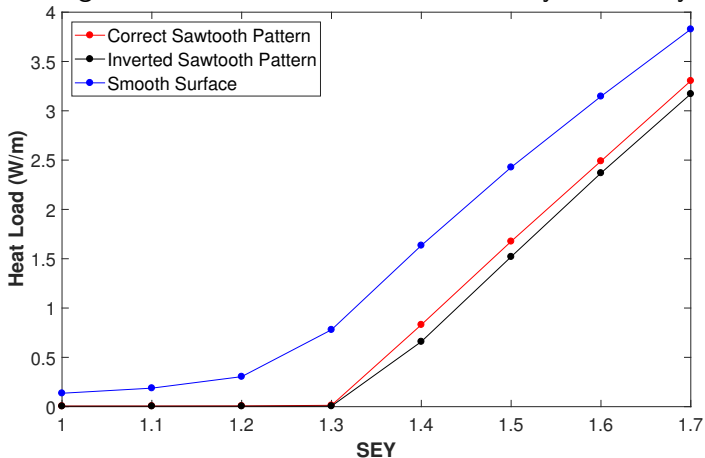
Linear Density

Average linear density as a function of SEY



Heat Load

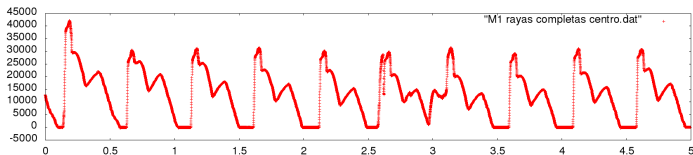
Average heat load as a function of secondary emission yield (SEY)



Future Work

Future Work

- Use a more realistic model of the sawtooth pattern



- Use different values of the surface aspect ratio and surface roughness to determine the importance of these values.
- Use filling patterns from 2017 and 2018
- Work on the quadrupoles

Acknowledgements

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