

Novel materials for dispersion engineering in an accelerator environment

Wednesday, 11 January 2017 11:15 (35 minutes)

This talk provides an introduction to novel materials for dispersion engineering in an accelerator environment. The focus will be on metamaterials, the unique effects they give rise to and how these can provide interesting responses in accelerators. An overview of existing metamaterials schemes for accelerator applications will be presented, including an in depth discussion on the CSRR (complementary split ring resonator) loaded waveguide for reverse Cherenkov applications. The challenges these materials pose in the accelerator environment will be discussed and methods to mitigate these effects proposed. In addition to metamaterials, wavelength scale dispersion engineering will be discussed in cases where the length scales of metamaterials are unsuitable. Finally, new plasmonic materials, such as transparent conducting oxides and intermetallics will be discussed and their integration into both metamaterial and dispersion engineering will be explored.

Summary

The talk plans to cover; an introduction to metamaterials, the basic principles, unique effects they give rise to, common metamaterial forms and interesting applications. Then it will move on to metamaterials in accelerators, looking at the challenges they pose, existing schemes and their drawbacks. I will then talk briefly on my own project of the CSRR loaded waveguide, the design considerations made, the electromagnetic analysis, the wakefield analysis and the particle in cell response. Wavelength scale dispersion engineering will then be discussed focusing on how this differs from metamaterials, and why this is a better choice for certain applications and environments. Finally I will provide an introduction to new plasmonic materials, and discuss their applications in both metamaterials and dispersion engineering.

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