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Modelling the mechanism of multipactor suppression through novel laser engineered structures

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Electron multipactor is a major problem in accelerators, both in accelerating cavities associated with dark current and beam induced e-cloud problems, and in RF distribution systems leading to catastrophic damage or in mild cases performance decrease and phase shifting. In many scenarios passive mitigation techniques are preferred. Multipactor may be completely avoided if the effective SEY is less than unity. Recently, grooved micron-size structures using laser processing have been shown to give dramatically improved response. This result prompted effort to understand the mechanism responsible for this reduction. This paper presents simulation work aimed at gaining improved understanding of the fundamental processes causing reductions in the secondary electron yield due to geometric effects, enabled by the VSim software suite. We identify constituent models and conclude that significant reduction in multipactor can be achieved through geometric modification. We discuss some potential applications and limitations of the new technology.

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