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CST PARTICLE STUDIO SIMULATIONS OF COAXIAL MULTIPACTOR SUSCEPTIBILITY AND EVOLUTION

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Multipactor breakdown is a cascade phenomenon that occurs in RF and microwave systems. It has been observed in microwave tubes, RF windows, coupling structures, transmission lines, and in accelerator structures. Multipactor can cause loading of microwave cavities, localized heating and detuning of signals. These effects can ultimately lead to inefficient operation and possible destruction of the device. Disruption of such devices, particularly of space-borne systems, must be avoided due to the extreme cost incurred by unexpected device failures. The large safety margins necessary to ensure that multipactor will never occur add excess bulk and cost to the device. These safety margins are based on susceptibility measurements from historical experiments, of which few have been conducted for coaxial geometry [1,2].
This work aims to investigate if simulations performed in CST Particle Studio can accurately predict the onset of multipactor in coaxial transmission lines. We use secondary electron emission data for copper with chemically cleaned surfaces [3]. Growth of multipactor has been explored by studying the evolution of the electron population after seeding with a few electrons. These simulations replicate the susceptibility data from Woo's experiments [1]. Ultimately, these simulations will be used to guide the design of a coaxial test bed that will be used to validate new theories and test the efficacy of mitigation schemes.

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