

Abstract (paper not available)

Charging Simulation for an Exposed Dielectric Considering the Internal Charge Deposition

Song Wang¹, Zhan-cheng Wu¹, Xiao-Jin Tang², Zhong Yi², Ye-nan Liu²

¹*Institute of Electrostatic and Electromagnetic Protection (China);* ²*Beijing Institute of Spacecraft Environment Engineering (China)*

The exposed dielectrics outside a satellite have direct interactions with the ambient plasma environment. If they are dielectric films, only surface incident current is needed for determination of the charging level. However, there are also some exposed dielectric in bulk form or with thickness more than 1mm, such that the impact of energetic electron penetration should be taken into accounts. This is done based on the current conservation law considering internal current source and boundary incident current due to energetic electron irradiation and surface charging factors respectively. The effect of radiation induced conductivity (RIC) is also included using the classical exponential function. Focusing on a planar board, simulation is performed using Geant4 for derivation of internal charge deposition and radiation dose. Charging results are obtained by numerically solving the current conservation law. Results show that RIC and the internal charge will lead to electric field distortion. The variation of board thickness and temperature non-uniform distribution also change much the charging results. It is hoped this charging model may provide useful reference for the next generation of SPIS.
