Abstract *(paper not available)*

SCATHA Surface Potential Measurements of Surface and Internal Charging

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The Satellite Surface Potential Monitor (SSPM) measured potentials on the surfaces of several exposed dielectric material samples on the Spacecraft Charging at High Altitudes (SCATHA) mission. The SCATHA mission operated for over ten years in an elliptical orbit near GEO. These material samples included aluminized Kapton, silvered Teflon, quartz fabric mounted on silvered Teflon, gold-flashed aluminized Kapton, and optical solar reflectors. Some samples rotated in and out of sunlight during the spacecraft spin and others remained in darkness. The response of the SSPM instrument to the measured environment is modeled and compared with the data for several charging events. A simulation of the internal charging of the samples is performed using a one-dimensional code that we have recently developed. The simulation program computes the electric field as a function of depth in the infinite planar material stack. It uses a Monte Carlo electron transport module coupled to an electric field solver including the effects of finite material conductivity. Detailed information on the ambient environment from the SCATHA particle and other measurements such as the spacecraft frame potential are used as inputs to the charging simulation. Several intervals are analyzed including the severe charging and electrostatic discharges observed on September 22, 1982. The calculation results are then used to infer which features in the SSPM data are due to surface charging from low energy particles and which are due to internal charge by high energy electrons. The modeling includes the effects of the radiation induced conductivity (RIC) on the charging levels. Recent laboratory measurements of RIC for several materials imply that it can significantly affect their charging levels on orbit. The implications of this investigation for surface and internal charging specifications are discussed.

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