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Observation and Characterization of Electrostatic Discharge in Insulating Materials Induced by Electron Beam Bombardment JENNIFER ROTH, RYAN HOFFMANN, J.R. DENNISON, Utah State University — Understanding the characteristics of electron beam bombardment that induce electrostatic discharge (ESD) of insulating materials is crucial to constructing an electrically stable spacecraft. A measurement system has been designed to determine the beam energy and charge flux densities at which spacecraft materials (bare and conductor-coated polymeric thin-film Kapton E) undergo ESD. Because ESD events can occur over very short time intervals multiple, simultaneous detection methods were employed as charge was accumulated on a sample surface; these included monitoring of sample current and optical emissions from the sample surface. Data from each of these detection methods were analyzed to determine the incident beam conditions which induced ESD, as well as the magnitude of the discharge events. Each sample was also examined with optical microscopy before and after testing to determine permanent changes in the materials due to ESD. We also consider the effects of electron emission, dark current conductivity, and radiation induced conductivity on the accumulation, dissipation and discharge of the accumulated charge.

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