Characterization of methods of removing surface charge for reduction of electrostatic discharge events

First A. Khandakar Nusrat Islam * [(1)], Second B. Mark Gilmore [(2)]
(1), (2) Department of Electrical and Computer Engineering,
The University of New Mexico, NM, USA

Dielectric surface charging is an important issue for spacecraft, as well as in microelectronics and explosive materials handling. In order to investigate dielectric surface charging and methods of removing the charge in detail, and in a controlled way, a test stand has been constructed. The test stand is built around a corona discharge source of the type used in photographic printing technologies. This source generates a corona discharge around a thin wire biased to a few kV dc with respect to a screen electrode. The corona screen is independently biased with respect to a ground plate on which a dielectric substrate, such as Kapton polyimide, is placed. The corona source screen is placed a few mm above the dielectric and biased to a few hundred volts to a few kV. The total surface charge density and surface potential on Kapton dielectric are measured before and after the electric discharge of the corona wire. The system is enclosed in a plexiglas box that allows for some measure of control over ambient temperature and humidity. Our goal is to design and characterize a method to reliably remove electrostatic charge from dielectric surfaces. A series of experiments are designed to determine the charge removal effectiveness of using a brush tool to remove the static charge from the Kapton dielectric surface. A conductive brush with a static dissipative handle mounted on a metal track proved most effective method that one end of the drain wire clamped to the conductive fibers and the other end tied to the ground. This drain method manually brushes the surface of the Kapton dielectric to remove static charge to passing the kapton polyimide surface through the conductive brush bristles that are overlapped to ensure a total surface charge removal. Experimental results on charging and charge removal effectiveness will be presented.