11. Oscillations in Insulator Leakage Current Under Steady Conditions of Synchronous Orbit Plasma and Photoillumination

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Abstract

In connection with the study of photoconductivity of insulating materials under conditions representative of spacecraft environment, it was found that oscillations (up to 30 percent of the maximum current) can occur in the leakage current through the sample when the sample is simultaneously exposed to an incident electron flux and an optical illumination of roughly one sun. For example with an incident current density of 10^{-9} A/cm^2 of 4 keV electrons and an illumination of one sun, the frequency of oscillation of leakage current was 0.3 Hz. Decreasing the current density to 0.2×10^{-9} A/cm^2 reduced the frequency to 0.06 Hz. The effect of changing incident electron energy does not appear to be as pronounced as changing current density. With a 0.005 in. -thick sample of Kaptan V, oscillations were not observed at energies below 2 kV, were maximum at about 4 kV, and their amplitude decreased with increasing energy above 4 kV.

This instability is of interest because it indicates that the measured parameters of an insulator under constant conditions of plasma and solar illumination may be far from constant, and may strongly affect the instantaneous differential potentials and therefore the occurrence of electrical discharges between adjacent areas on a space vehicle.

SESSION V

DESIGN AND TEST