Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Effect of Electron Seeding on Experimentally Measured Multipactor Discharge Threshold JONATHAN NOLAND, TIMOTHY GRAVES, COLBY LEMON, MARK LOOPER, ALEX FARKAS, The Aerospace Corporation
— Multipactor is a vacuum phenomenon in which electrons, moving in resonance with an externally applied electric field, impact material surfaces. If the number of secondary electrons created per primary electron impact averages more than unity, the resonant interaction can lead to an electron avalanche. Multipactor is a generally undesirable phenomenon, as it can cause local heating, absorb power, or cause detuning of RF circuits. In order to increase the probability of multipactor initiation, test facilities often employ various seeding sources such as radioactive sources (Cesium 137, Strontium 90), electron guns, or photon sources. Even with these sources, the voltage for multipactor initiation is not certain as parameters such as material type, RF pulse length, and device wall thickness can all affect seed electron flux and energy in critical gap regions, and hence the measured voltage threshold. This study investigates the effects of seed electron source type (e.g., photons versus beta particles), material type, gap size, and RF pulse length variation on multipactor threshold. In addition to the experimental work, GEANT4 simulations will be used to estimate the production rate of low energy electrons (< 5 keV) by high energy electrons and photons. A comparison of the experimental fluxes to the typical energetic photon and particle fluxes experienced by spacecraft in various orbits will also be made. Initial results indicate that for a simple, parallel plate device made of aluminum, there is no threshold variation (with seed electrons versus with no seed electrons) under continuous-wave RF exposure.

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Date submitted: 13 Jul 2012 Electronic form version 1.4