Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Effects of Incident Electron Fluence and Energy on the Electron Yield Curves and Emission Spectra of Dielectrics ALEC SIM, J.R. DENNISON, Utah State University, CLINT THOMSON, ATK Thiokol — We present an experimental study of evolution of electron emission yields and spectra as a result of internal charge build up due to electron dose. Reliable total, backscattered and secondary yield curves and electron emission spectra for un-charged insulators using a low fluence, pulsed electron beam ($\leq$5 μsec at $\leq$ 3 nA/mm^2 or =10^5 e/mm^2 per pulse) with low energy electron and UV flooding to neutralize the charging between pulses. Quantifiable changes in yield curves are observed due to <100 fC/mm^2 fluences for several excellent dielectric thin film materials. We find good agreement with a phenomenological argument based on insulator charging predicted by the yield curve; this includes an approximately linear decrease in the magnitude of the yield as incident energies approach the crossover energies and an exponential decrease in yield as accumulated internal charge reduces the landing energy to asymptotically approach a steady state surface charge and unity yield. We also find that the exponential decay of yield curves with fluence exhibit an energy dependant decay constant, α(E), over a broad range of incident energies below, between and above the crossover energies. Finally, we present some preliminary physics-based models for this energy dependence and relate our charging measurements to the physics of charge deposition, trapping, transport and emission from insulators.

J.R. Dennison
Utah State University

Date submitted: 05 Dec 2004 Electronic form version 1.4