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Non-Linear Simulation for the Disturbance of Electronic Systems in Low Earth Orbits by High Energy Electrons WILLIAM ATKINSON, The Boeing Company/Dept. of Electro-Optics — A Simulator is presented that models the disturbance of electrical circuits by high energy electrons trapped in earth's radiation belts; the model components are a module computing the electron fluence rate given the altitude, the time of the year, and the sunspot number, a module that models the interaction of the electrons with the materials of the electrical component, and a module that computes the charge and the magnitude of electrical field in the insulating materials as a function of time. The Adameic-Calderwood equation is used to model the relationship between the electrical conductivity of dielectric materials and the electric field intensity, making the charging/discharging equations highly non-linear. The non-linearity of the charging equations becomes especially pronounced in magnetic storms during intense solar flares. The results show that the electric field intensity can approach the dielectric breakdown strength in materials commonly used as dielectrics in space-based systems and that the fields can be sustained at high levels for as long as an hour.

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