

NO#182

A New Study in Electron Trap Modification as a Result of Insulating Materials Exposure to Space Weather

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This study endeavors to understand the role the space environment plays in modifying the Density of States (DOS) in the band gap of highly disordered insulating materials. This project was recently funded by the Air Force Office of Scientific Research and has a start date of summer 2014. Material presented in this paper will include the proposed test plan, existing and proposed facilities, and preliminary DOS data of pristine Qioptic coverglass. Current work in the field focuses on Beginning-of-Life (BOL) materials; however upon deployment all spacecraft materials begin to age due to exposure to energetic particles. The materials under investigation will be Polyimide (Kapton), PTFE (Teflon) and LDPE (low density polyethylene). Each of these materials, in its BOL state, will have its charging properties extensively studied using a suite of charging tests. The materials will then be subjected to aging in a simulated GEO environment of deep UV light and high energy electrons as well as a LEO environment of deep UV, cold plasma, high energy electrons and atomic oxygen. The aged materials' charging properties will again be measured during several stages in the materials lifetime to provide trends for DOS modification. These data will lay the ground work for an understanding of the underlying physical phenomenon that govern the aging process and its relation to charging.