



NASA STTR 2010 Phase I Solicitation

T8.02 Spacecraft Internal Electrostatic Discharge (IESD) Resistant Circuit Board Materials

Lead Center: LaRC

Participating Center(s): JPL

The improvement in the performance of spacecraft circuit board materials with resistance to IESD will enhance performance, lifetime, and mission assurance. Circuit boards are sought from composite materials, such as graphite fibers and epoxy or polyimide resins that dissipate electron charge. It is important for the circuit board materials to be compared for circuit board physical properties (dielectric constant, temperature range, breakdown voltage, coefficient of thermal expansion, and etc.) with the current commercial state of the art materials, such as FR4 and others. A typical volume resistivity of $10e12$ ohm cm is needed for the circuit board material and the ability to leak electron charge at the microscopic level. Charge dissipation studies can be initially performed by electron gun or scanning electron microscope (SEM) for initial screening. The outer planet environments, such as Jupiter, have predominantly highly charged trapped electrons, which pose challenges for protecting critical spacecraft components inside the bus from internal electrostatic discharge. Charged environments can be found at geosynchronous and medium Earth orbits where interactions with trapped radiation belts that are charged by solar space weather are prevalent. Polymeric and composite circuit board materials that can assist in reducing adverse affects of internal electrostatic discharge are sought without the loss of electrical, thermal, and mechanical properties. Research and development of spacecraft IESD resistant circuit board materials support the mission assurance of NASA earth science, exploration, and space science missions outlined in the decadal survey.