

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)
Interactive Presentations - IAF HUMAN SPACEFLIGHT SYMPOSIUM (IP)

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ELECTRODYNAMIC DUST SHIELD EXPERIMENT FOR THE MATERIALS ON INTERNATIONAL
SPACE STATION – FLIGHT FACILITY

Abstract

Electrodynamic Dust Shield Experiment for the Materials on
International Space Station – Flight Facility

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Future exploration missions to the Moon and Mars will continue to have issues with the ever present dust in the environment. On the Moon, contamination of equipment during the Apollo missions caused many problems including incorrect instrument readings and increased temperatures due to masking of thermal radiators. Dust covered the space suits, obscured the face shields and propagated to the cabin and into the crew eyes and lungs. On Mars, dust obscured the Mars rover solar panels reducing their power output. Due to the many potential issues, both the International Space Exploration Coordination Group (ISECG) and NASA have identified dust mitigation as a critical technology especially for future, long duration missions.

The Electrostatics and Surface Physics Lab in Swamp Works at the Kennedy Space Center has been developing an Electrodynamic Dust Shield (EDS) to remove dust from multiple surfaces, including glass shields and thermal radiators. This technology, which uses oscillating, high voltage (kV), low current (μA) signals to generate changing electric fields, has been tested in lab environments and has evolved over several years. Tests of the technology include reduced gravity flights (one-sixth g) in which Apollo Lunar dust samples were successfully removed from glass shields while under vacuum ($10^{-6}kPa$).

The EDS Experiment is scheduled to be flown in 2019 on the Materials on International Space Station – Flight Facility (MISSE-FF)-11. It will expose a glass EDS panel designed for optical systems, such as view ports, visors, and solar panels and a Kapton-coated aluminum panel with thermal paint designed for thermal radiators to the low energy solar wind flux, thermal cycle,

cosmic rays, and ultra-short UV. Compact, low-energy power supplies will generate the electric fields on surfaces of the panels. Long-duration exposure of the EDS panels and electronics to the space environment in the wake direction of MISSE-FF will provide needed data for Lunar, Martian, and asteroid missions.