National Aeronautics and Space Administration

Sounding Rocket Mission Fact Sheet

Mission: Beam-Spacecraft Plasma Interaction and Charging Experiment (B-SPICE)
Mission Number(s): 36.382 UE
Principal Investigator: Dr. Gilchrist/University of Michigan
Launch Date: November 22, 2024
Launch site: White Sands Missile Range, NM

Description

Electron beam capable spacecraft missions can enable a new realm of active experiments in the magnetosphere. For example, an electron beam fired from the Earth's magnetosphere into its atmosphere could be used to trace magnetic field lines in real-time and answer fundamental questions in magnetosphere-ionosphere coupling. These kinds of active missions in the magnetosphere quickly run into spacecraft charging issues that limit beam emission due to the sparse ambient plasma environment. Therefore the development of a spacecraft-charging mitigation technique is required to ensure safe operation and mission success. Laboratory experiments have shown that the plasma source can emit substantial ion currents off the plasma contactor surface. As a result, induced spacecraft charging due to electron beam emission may be mitigated by the emission of an on-board plasma source.

The Beam-Spacecraft Plasma Interaction and Charging Experiment (B-SPICE) is a tethered rocket experiment, dedicated to investigate the mitigation of spacecraft charging induced by an electron beam using a plasma contactor. The experiment studies ion current production, plasma plume expansion, and expellant utilization in relation to mitigation effectiveness to understand how the system may scale for magnetospheric experiments. Successful completion of this experiment will raise the technological readiness level (TRL) of the described spacecraft-charging mitigation scheme for application to active experiments in the low-density magnetosphere.