Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

NRL SPADE plasma impedance probe measurements on the International Space Station[1] BILL AMATUCCI, ERIK TEJERO, GEORGE GATLING, DAVID BLACKWELL, United States Naval Research Laboratory, DAVID WALKER, MacAulay-Brown, Inc., TYLER LEWANDOWSKI, RAY DIXON, United States Naval Research Laboratory — The Space PlasmA Diagnostic suitE (SPADE) instrument, developed by the U.S. Naval Research Laboratory (NRL), is a plasma impedance probe designed to monitor background space plasma conditions and provide early warning of the onset of hazardous levels of spacecraft charging, was delivered to the International Space Station (ISS) onboard the SpaceX CRS-17 launch on May 4, 2019 as part of the Department of Defense Space Test Program's STP-H6 mission. The SPADE experiment consists of two dipole antennas, one active antenna that is used to excite the local plasma and another passive dipole antenna that observes the excitation. The active probe is swept across a range of frequencies and DC voltage biases to determine the plasma impedance spectrum. The impedance measurements yield properties of the plasma, such as density, plasma potential, and electron temperature, while also providing data indicating the charging level of the ISS relative to the local plasma. SPADE responds to slight changes in the plasma sheath that forms around a charged object, providing a unique method for the early detection of charging. The year-long mission will test SPADE's ability to detect hazardous station charging events while providing long-term records of space weather conditions.

[1]This work supported by the NRL Base Program.

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Date submitted: 02 Jul 2019 Electronic form version 1.4