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Ionospheric plasma characterization using the NRL SPADE plasma impedance probe* WILLIAM AMATUCCI, ERIK TEJERO, GEORGE GATLING, DAVE BLACKWELL, United States Naval Research Laboratory, DAVE WALKER, McAulay-Brown, Inc. — 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. SPADE has been operating on the International Space Station (ISS) since May 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. SPADE active dipole measurements demonstrating the characterization of ionospheric plasma conditions and ISS charging will be presented. *This work supported by the NRL Base Program.

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