Abstract Submitted
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Development of a High-Time/Spatial Resolution Self-Impedance Probe for Measurements in Laboratory and Space Plasmas[1] AMI DUBOIS, ERIK TEJERO, GEORGE GATLING, WILLIAM AMATUCCI, United States Naval Research Laboratory — Impedance probes are often used on satellites and sounding rockets to measure fundamental plasma parameters in the ionosphere. Conventional impedance probe methods generally involve sweeping the frequency and measuring the complex plasma impedance. However, plasma parameters drastically change in the time it takes to complete a measurement, which reduces the accuracy and spatial resolution of the measurement. Development of a fast impedance probe is ongoing at the U.S. Naval Research Laboratory (NRL) with the goal of increasing the spatial resolution of measurements. To achieve this, a short-time Gaussian monopulse with a center frequency of 40 MHz is utilized. Laboratory experiments performed in the Space Physics Simulation Chamber at NRL show that it is possible to make measurements of the full frequency spectrum in 10 s, equating to a spatial resolution on the order of 1 cm. Impedance probe results using the novel short-time pulsed method will be presented which demonstrate that plasma parameters such as electron density, sheath frequency, and electron-neutral collision frequency can be derived from the data, and results compare well with conventional methods and theoretical impedance models.

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Ami DuBois
United States Naval Research Laboratory

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