

Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Measurement of low temperature plasma properties using non-invasive impedance measurements ERIC GILLMAN, BILL AMATUCCI, ERIK TEJERO, DAVID BLACKWELL, US Naval Research Laboratory — A plasma discharge can be modeled electrically as a combination of capacitors, resistors, and inductors. The plasma, much like an RLC circuit, will have resonances at particular frequencies. The location in frequency space of these resonances provides information about the plasma parameters. These resonances can be detected using impedance measurements, where the AC impedance of the plasma is measured by sweeping the frequency of an AC voltage applied to a sensor and determining the magnitude and phase of the measured current. In this work, an electrode used to sustain a glow discharge is also used as an impedance probe. The novelty of this method is that insertion of a physical probe, which can introduce perturbation and/or contamination, is not necessary. This non-invasive impedance probe method is used to measure the plasma discharge density in various regimes of plasma operation. Experimental results are compared to the basic circuit model results. The potential applications of this diagnostic method and regimes over which this measurement method is valid will be discussed.

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Date submitted: 20 Jul 2017

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