Abstract Submitted
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Student Award Finalist: Negative Power Absorption in Low-Pressure Inductive Discharges JAN TRIESCHMANN, MARTIN LAPKE, RALF PETER BRINKMANN, THOMAS MUSSENBROCK, Institute of Theoretical Electrical Engineering, Ruhr University Bochum, Bochum, Germany — Inductively coupled radio-frequency plasmas for technological applications are frequently operated at relatively low gas pressures (below 10 Pa). One specific feature of this regime is that collisions of electrons with atoms or molecules of the neutral background gas are infrequent. Under these conditions the discharges are operated in the nonlocal regime, i.e., the relation between the high frequency current density and the electric field is nonlocal. To describe this specific situation, Maxwell's equations have to be coupled self-consistently to Boltzmann's equation. In this paper we present an analytical, self-consistent solution to the one-dimensional problem of a plane wave propagating from one half-space (vacuum) into the other filled with a bounded homogeneous plasma. We particularly discuss the anomalous skin effect, negative power absorption, and phase mixing. The results from the analytical model are finally compared with results from self-consistent Particle-In-Cell simulations.

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