Abstract Submitted
for the GEC17 Meeting of
The American Physical Society

Nonlinear interaction of capacitive discharges and power matching networks FREDERIK SCHMIDT, JAN TRIESCHMANN, RALF PETER BRINKMANN, Institute of Theoretical Electrical Engineering, Ruhr University Bochum, THOMAS MUSSENBROCK, Electrodynamics and Physical Electronics Group, Brandenburg University of Technology — External lumped element circuits attached to capacitively coupled plasmas are widely used e.g., in matching networks to maximize the absorbed power. At low pressures the plasma current often consists not only of a single driving-frequency but also of nonlinearly excited harmonics, which have been shown to be of strong influence on the absorbed power and, therefore, the plasma density [1]. The interaction between these harmonics and the external lumped element circuit has to be taken into account in order to achieve maximum power transfer from generator to plasma. For a full understanding of the underlying physics of this coupling a simulation which considers both the plasma and the circuit dynamics can provide useful insights. In this work a method is presented for coupling an equivalent circuit of the plasma to an electrical circuit composed of linear elements modeled with ngSPICE [2]. This is used to investigate the nonlinear interaction of the matching network and capacitive discharges and especially its unexpected influence on the electron heating.

[1]T. Mussenbrock *et al.*, Appl. Phys. Lett. **88**, 151503 (2006).
[2]http://ngspice.sourceforge.net

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Date submitted: 31 May 2017 Electronic form version 1.4