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Resonance heating of dual frequency capacitive discharges DENNIS ZIEGLER, THOMAS MUSSENBROCK, RALF PETER BRINKMANN, Ruhr University Bochum — The dynamics of dual frequency capacitively coupled plasmas (2f-CCPs) is investigated using an approach that integrates theoretical insight and experimental data. Basis of the analysis is an extended version of a recently published model which casts the high frequency behavior of asymmetric 2f-CCPs in terms of a nonlinear second-order differential equation, or equivalently, a lumped element equivalent circuit [1]. The current work bases the choice of its model parameters on the data obtained by an actual 2f-CCP experiment conducted by Semmler et al. [2]. The analysis shows that the system is governed by a nonlinear interaction of the applied RF with the inner dynamics of the discharge, particularly with the collective oscillation mode known as the plasma series resonance (PSR). With respect to the power dissipation, two distinct paths can be identified which contribute in approximately equal parts. The first path is non-resonant and corresponds to the traditional picture of 2f-CCPs; the second path is resonant and identical with the mechanism of nonlinear electron resonance heating (NERH) proposed in [1,3]. [1] T. Mussenbrock, D. Ziegler, and R.P. Brinkmann, Phys. Plasmas 13, 083501 (2006) [2] E. Semmler, P. Awakowicz, and A. von Keudell, Plasma Sources Sci. Technol. 16, 839 (2007) [3] T.Mussenbrock and R.P. Brinkmann, Appl. Phys. Lett. 88, 151503 (2006)

Dennis Ziegler
Ruhr University Bochum

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