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Voltage vs. Current Driven CCRF Discharges: Differences in Electron and Ion Dynamics SEBASTIAN WILCZEK, JAN TRIESCHMANN, JULIAN SCHULZE[1], RALF PETER BRINKMANN, Ruhr University Bochum, Bochum, Germany, ARANKA DERZSI, PETER HARTMANN, ZOLTAN DONKO, Wigner Research Center for Physics, Budapest, Hungary, THOMAS MUSSENBROCK, Ruhr University Bochum, Bochum, Germany — In numerical simulations of capacitively coupled radio frequency (ccrf) discharges the following fundamental question is unanswered: What are the implications of driving the discharge with a sinusoidal current source vs. a sinusoidal voltage source? Several analytical models as well as simulations use current sources as boundary conditions. Especially at low pressures, however, the theory of the self-excitation of the plasma series resonance (PSR) by the nonlinearity of the plasma sheath is eliminated when using a current source (as no harmonics in the current are allowed). In contrast, a sinusoidal voltage source can strongly enhance the power dissipation via the self-excitation of the PSR (nonlinear electron resonance heating). In this work, we investigate the differences between voltage and current driven sources with respect to the electron and ion dynamics. By means of Particle-In-Cell simulations, we analyze both scenarios for identical input powers coupled into the system. Significant differences are discussed for different parameter sets, e.g. input power (voltage and current amplitude), driving frequency and pressure.

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