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Nonlocal and nonlinear dynamics in low pressure capacitively coupled radio frequency discharges[1] SEBASTIAN WILCZEK, Ruhr University Bochum, Germany, JAN TRIESCHMANN, Brandenburg University of Technology, Cottbus, Germany, JULIAN SCHULZE, RALF PETER BRINKMANN, Ruhr University Bochum, Germany, ZOLTAN DONKO, Wigner Research Centre for Physics, Budapest, Hungary, THOMAS MUSSENBROCK, Brandenburg University of Technology, Cottbus, Germany — In capacitively coupled radio frequency (CCRF) discharges at low pressures, the electron power gain is dominated by electron interaction with the plasma sheath. During sheath expansion a bunch of energetic electrons is accelerated into the bulk region and carries energy to sustain the discharge via ionization. Additionally, the penetration of these beam-like electrons into the plasma bulk can lead to a local electric field reversal which leads to a nonlinear interplay between bulk electrons and the expanding sheath. The consequences are higher order oscillations in the RF current as well as the excitation of electrostatic waves. Particularly at low pressures, the electron mean free path is frequently larger than the gap size. In this nonlocal regime, the nonlinear sheath dynamics at one electrode influence the behavior in front of the opposite electrode, i.e., energetic electrons traverse through the discharge almost collisionlessly and interact with the opposing sheath at different phases. In this work, nonlinear and nonlocal dynamics, in particular the electron power gain, are investigated by means of 1d3v PIC simulations of CCRF discharges.

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