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Investigation of plasma-sheath resonances in low pressure discharges[1] SCHABNAM NAGGARY, EFE KEMANECI, RALF PETER BRINKMANN, Ruhr University Bochum, MUSTAFA MEGAHED, ESI Group —
Plasma sheath resonances (PSR) arise from a periodic exchange between the kinetic electron energy in the plasma bulk and the electric field energy in the sheath and can easily be excited by the sheath-generated harmonics of the applied RF. In this contribution, we employ a series of models to obtain a well-defined description of these phenomena. In the first part, we use a global model to study the influence of the nonlinear charge-voltage characteristics on the electron dynamics. However, the global model is restricted to the assumption of spatially constant potential at each driven and grounded electrode and thus delivers only the fundamental mode of the current. In order to remedy the deficiency, we introduce a spatially resolved model for arbitrary reactor geometries with no assumptions on the homogeneity of the plasma. An exact evaluation of the analytical solution is realized on the assumption of a cylinderical plasma reactor geometry with uniform conductance. Furthermore, the spatially resolved model is capable of being utilized for a more realistic CCP reactor geometry and non homogeneous plasma provided the conductance distribution is known. For this purpose, we use the CFD-ACE+ tool. The results show that the proposed multi-mode model provides a significant improvement.

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