Abstract Submitted
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Nonlinear standing wave excitation by series resonance-enhanced harmonics in low pressure capacitive discharges[1] M.A. LIEBERMAN, A.J. LICHTENBERG, EMI KAWAMURA, University of California, Berkeley, A.M. MARAKHTANOV, Lam Research Corporation — It is well known that standing waves having radially center-high rf voltage profiles exist in high frequency capacitive discharges. It is also known that in radially uniform discharges, the capacitive sheath nonlinearities excite strong nonlinear series resonance harmonics that enhance the electron power deposition. In this work, we consider the coupling of the series resonance-enhanced harmonics to the standing waves. A one-dimensional, asymmetric radial transmission line model is developed incorporating the wave and nonlinear sheath physics and a self-consistent dc potential. The resulting coupled pde equation set is solved numerically to determine the discharge voltages and currents. A 10 mT argon base case is chosen with plasma density 2×10^{16} m^{-3}, gap width 2 cm and conducting electrode radius 15 cm, driven by a high frequency 500 V source with source resistance 0.5 ohms. We find that nearby resonances lead to an enhanced ratio of 4.5 of the electron power per unit area on axis, compared to the average. The radial dependence of electron power with frequency shows significant variations, with the central enhancement and sharpness of the spatial resonances depending in a complicated way on the harmonic structure.

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