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Nonlinear electron resonance heating vs. the Herlofson paradox
JENS OBERRATH, MARTIN LAPKE, DENNIS ZIEGLER, THOMAS MUSSEN-BROCK, RALF PETER BRINKMANN, Ruhr University Bochum — In the regime of low gas pressure, capacitive rf discharges exhibit resonant behavior which can have a profound impact on the energy budget. This contribution compares two scenarios of resonance-related electron heating known as, respectively, “nonlinear electron resonance heating” (NERH) and “the Herlofson paradox”. NERH arises from the self-excitation of the plasma series resonance by harmonics generated via the nonlinearity of the plasma sheath. \(^1\) The Herlofson paradox, on the other hand, is a linear phenomenon that occurs at points where the electron plasma frequency is locally equal to the rf frequency. \(^2,3,4\) This contribution intended to point out similarities and differences of the two scenarios. \(^1\) T. Mussenbrock and R.P. Brinkmann, Appl. Phys. Lett. \textbf{88}, 151503 (2006), \(^2\) F.W. Crawford and K.J. Harker, J. Plasma Phys. \textbf{8}, 261 (1972), \(^3\) V.P.T. Ku, B.M. Annaratone, and J.E. Allen, J. Appl. Phys \textbf{84}, 6536 (1998), \(^4\) V.P.T. Ku, B.M. Annaratone, and J.E. Allen, J. Appl. Phys \textbf{84}, 6546 (1998), \(^4\) F.W. Crawford and K.J. Harker, J. Plasma Phys. \textbf{8}, 261 (1972).

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