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Electron kinetics in helicon discharge GUANGYE CHEN, LAXMI-NARAYAN RAJA, ALEXEY AREFIEV, BORIS BREIZMAN, The University of Texas at Austin — A self-consistent description of the helicon discharge requires power balance analysis, involving electron kinetics. A steady-state electron distribution is established when electron heating becomes balanced by electron energy losses on atom excitation. The rf-electric field and plasma density are the primary parameters that determine key features of the steady-state electron energy distribution function. The electron distribution has been studied in four different heating regimes using the Direct Simulation Monte Carlo method. We have found that the electron distribution is significantly non-Maxwellian in the dense gas regime, where electron-atom collisions dominate. In this regime, the electron distribution has also been calculated analytically, assuming that the rf-field is relatively weak, so that the quiver energy is small compared to the excitation threshold. The analytical solution has been used to benchmark the code and the computed distribution agrees well with the analytical distribution. The observed non-Maxwellian feature of the electron distribution function has a strong impact on the cost of ionization in the discharge.

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