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Formation of Non-Maxwellian, Non-Isotropic Electron Velocity Distribution Functions and Its Influence on Discharge Structure[1] IGOR D. KAGANOVICH, PPPL, YEVGENY RAITSES, ALEX V. KHRABROV, PPPL, Princeton University, USA, VLADIMIR I. DEMIDOV, AFRL, Wright-Patterson AFB, USA, DMYTRO SYDORENKO, University of Alberta, Edmonton, Canada
— Under most conditions the EVDF in gas discharges is isotropic. However, at low pressures or high electric field the EDVF may become anisotropic. We report on recent advances in studies of non-isotropic EVDF in the Hall thruster discharges and the cathode fall region of dc discharges. In Hall thrusters due to low pressure, the bulk EVDF is strongly anisotropic with the effective electron temperature in one direction being few times larger than in another direction. In a dc discharge in helium, electrons are accelerated in cathode fall faster than being scattered, which results in formation of non-isotropic EVDF. Analytical formulas for the EVDF and sheath potentials are derived for both cases. Observed complex nonlinear processes: relaxation oscillations in Hall thrusters and abrupt changes in structure of dc discharges with auxiliary biased electrodes for plasma control are explained.

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