Computational Study of the Behavior of the Electron Distribution Function in the Discharge Channel of a Hall Thruster

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This work investigates the electron distribution function in a cathode region of the Hall thruster discharge channel in various magnetic field configurations using a two-dimensional axial-azimuthal electrostatic Particle-in-Cell (2D2V PIC) model. The temporal evolution of the distribution function was analysed, and the contribution of different energy groups to the turbulent current generated by the interaction with azimuthal waves [1] was determined. Two distinct generation mechanisms were identified. They are differentiated by the presence or absence of a dominant energy group of electrons with the Larmor radius, which is smaller than the wavelength of azimuthal instabilities. Periodic modulations in the profile of the velocity distribution function are observed if a dominant group is present, namely the fraction of electrons in a dominant group and the magnitude of turbulent current change synchronously.

[1] Kaganovich I D, Smolyakov A, Raitses Y, Ahedo E, Mikellides I G, Jorns B, Taccogna F, Gueroult R, Tsikata S, Bourdon A *et al.* 2020 *Physics of Plasmas* **27**