

Hall thruster virtual lab

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A realistic three-dimensional fully kinetic particle simulation of a Hall-effect thruster discharge and plume regions has been attempted.

The model consists of a Particle-in-Cell (PIC) methodology tracking electrons and propellant ions in their self-consistent electric field. A detailed secondary electron emission representation is also implemented in addition with electron-atoms and ion-atoms volume collisions. The model is able to capture the start-up transient phase and the most relevant features of axial, radial and azimuthal behaviors of the steady-state phase detecting sheath instability and azimuthal fluctuations in the acceleration region. Ion-induced erosion and plume divergency are aestimated from code output. The model has the potentiality to adapt to the different HET configurations (cusped-field, magnetic shielded, wall-less, cylindrical, etc.) and to single out the different mechanisms contributing to electron anomalous cross-field transport and to investigate on the proper incidence on it.

The model contains a Graphical User Interface (GUI) from where the user can select the configuration (geometrical, electrical, magnetic and propellant/wall material parameters) to be studied.

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