

Improvements in global modelling of gridded ion thrusters

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R. Lucken, T. Lafleur, P. Grondein, A. Bourdon, P. Chabert, A. Aanesland

LPP, CNRS, Ecole polytechnique, UPMC Univ Paris 06, Univ. Paris-Sud, Observatoire de Paris, Université Paris-Saclay, Sorbonne Université, PSL Research University, 91128 Palaiseau, France

PEGASES is an ion-ion thruster concept developed at LPP for over ten years. The neutralization of the plume by alternate negative and positive ion extraction leads to a thruster design where no external neutralizer is required anymore. Formerly simulated with an electropositive Argon plasma [1], a first 0D fluid model of this thruster was developed including more complex molecular iodine chemistry [2]. Recently, neutral gas heating by ion acceleration in the sheath was added to the model, which has a very large influence in the neutral power balance.

Following the description of collisionless heating in inductively coupled RF plasma provided in [3], stochastic heating was also taken into account both through an effective collision frequency, and a heating term in the electron power balance. Refining the global model leads to a better predictability of the thruster efficiency.

Both numerical PIC simulations and experiments are in progress to validate the analysis that were conducted in this paper.

[1] P. Chabert, J. Arancibia Monreal, J. Bredin, L. Popelier, and A. Aanesland. *Physics of Plasma*, July 2012.

[2] P. Grondein, T. Lafleur, P. Chabert, and A. Aanesland. *Physics of Plasmas*, 2016.

[3] M. A. Lieberman and A. J. Lichtenberg. *Principles of Plasma Discharges and Materials Processing*. Wiley, second edition edition, 2005.

Primary author: Mr LUCKEN, Romain (Laboratoire de physique des Plasmas)

Co-authors: Prof. AANESLAND, Ane (LPP); Prof. BOURDON, Anne (LPP); Prof. CHABERT, Pascal (LPP); Dr GRONDEIN, Pascaline (LPP); Dr LAFLEUR, Trevor (LPP, CNES)

Presenter: Mr LUCKEN, Romain (Laboratoire de physique des Plasmas)

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