Call for applications for PhD student position in the laboratory of excellence, labex plas@par

Title of the PHD project: Alternate acceleration of positive and negative ions for application in space propulsion

Project description

The LPP proposes a new concept of space propulsion called PEGASES, for Plasma propulsion with Electronegative GASES. PEGASES is a gridded thruster, which accelerates alternately positive and negative ions for thrust. The originality and strength lays in the formation of an ion-ion region, free of electrons, in the vicinity of the acceleration grids. This ion-ion plasma allows the acceleration of both positive and negative ions, such that when the grids are biased alternately, the produced beam is composed of packets of positive and negative ions that recombine quickly in the downstream space. In theory the thrust can therefore be provided by an almost neutral beam without the need for external charge and current compensation and without downstream electrons. During the last few years we have carried out preliminary experimental studies and Particle-In-Cell (PIC) simulations. Our results have provided a proof-of-concept, however needless to say that there is still much work remaining to make this concept optimized for an application in space.

The proposed PhD project will focus on the physics of ion-ion plasma formation and the alternate acceleration of ions from these plasmas. This work will provide a detailed description, analysis, and assessment of the potential use of the PEGASES thruster, and contribute to bring PEGASES closer to our main target, namely that it one day will propel a satellite or vehicle in space. The work will be driven by experiment and backed up by developing analytical models and using our existing PIC codes.

[1] A. Aanesland, A. Meige and P. Chabert, "*Electric propulsion using ion-ion plasmas*." Journal of Physics: Conference Series, **162** (2009) 012009.
[2] A. Aanesland, S. Mazouffre and P. Chabert, *"Space Exploration Technologies Pegases."* Europhysics News, **42** (2011) 28–31.
[3] J. Bredin, P. Chabert and A. Aanesland, *"Charged-particle density and temperature gradients across magnetic barriers in electronegative plasmas."* Applied Physics Letters, (submitted 2013)

Requirements for the candidate:

The candidate should have a background in low temperature plasma physics, preferably with a Master in plasma physics. Competence in both experimental techniques and analytical models is preferred. The candidate will be a part of an international team and should master English as working language (written and oral).

Location and starting date:

Application with detailed CV, copies of degree diplomas and grades, two reference letters, copies of any previous research-related work and personal statement explaining your motivation. Application deadline is May 15, 2013.

The application should be sent preferably by e-mail to the following address: ane.aanesland@lpp.polytechnique.fr.