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Magnetic Electron Filtering by Fluid Models for the PEGASES Thruster GARY LERAY, PASCAL CHABERT, LPP-Ecole Polytechnique-CNRS, ALLAN LICHTENBERG, MICHAEL LIEBERMAN, EECS-UC Berkeley — The PEGASES thruster produces thrust by creating positive and negative ions, which are then accelerated. To accelerate both type of ions, electrons need to be filtered, which is achieved by applying a static magnetic field strong enough to magnetize the electrons but not the ions. A 1D fluid model with three species (electrons, positive and negative ions) and an analytical model are proposed to understand this process for an oxygen plasma with p = 10 mTorr and B_0 = 300 G [1]. The resulting ion-ion plasma formation in the transverse direction (perpendicular to the magnetic field) is demonstrated. It is shown that an additional electron/positive ion loss term is required. The solutions are evaluated for two main parameters: the ionizing fraction at the plasma center (x = 0), n_{e0}/n_g, and the electronegativity ratio at the center, α_0=n_{n0}/n_{e0}. The effect of geometry and magnetic field amplitude are also discussed.

[1] Leray G, Chabert P, Lichtenberg A J and Lieberman M A, *J. Phys. D: Appl. Phys., Plasma Modelling Cluster issue*, to appear (2009)

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