Operation of a Plasma Lens in the Plume of a Hall Thruster

Martin E. Griswold, Yevgeny Raitses and Nathaniel J. Fisch
Princeton Plasma Physics Laboratory, Princeton University, Princeton, New Jersey, 08543

martin.griswold@gmail.com

The electrostatic plasma lens (PL) [1,2] has been shown to focus moderate to high-energy neutralized ion beams produced by gridded ion sources [3]. The PL electrode introduces an electrostatic field that focuses the ions, and electron current to the PL electrode is suppressed with a magnetic field that is strong enough to magnetize electrons but not ions. The Hall thruster produces a neutralized ion beam that has a much larger energy spread and divergence than beams produced by gridded ion sources, and focusing of the plume of the thruster with a PL has not previously been demonstrated. We present data showing the operation of a PL in the plume of a Cylindrical Hall thruster [4]. The PL focuses the plume without adversely affecting the operation of the thruster, but the PL electrode draws large anomalous current.

References

Figure 1. Ion current density measured vs. angle 73cm from the thrusters exit. The plasma lens increases the current density at the center by a factor of five.