

Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

A halo-shaped energetic plasma flow from Hall thrusters¹
YEVGENY RAITSES, JEAN C. GAYOSO, ENRIQUE MERINO, LELAND ELLISON, MARTIN GRISWOLD, NATHANIEL J. FISCH, Princeton Plasma Physics Laboratory, Princeton, NJ 08543 — The use of permanent magnets instead of electromagnet coils for Hall thrusters can be advantageous for low power space applications. The plasma measurements revealed that the miniaturized cylindrical Hall thrusters with permanent magnets and electromagnet coils operate rather differently. In particular, the ion current density distribution from the permanent magnet thrusters has an unusual halo shape, with a majority of high energy ions flowing at large angles with respect to the thruster centerline. Plasma potential and LIF measurements showed that a stronger magnetic field outside the permanent magnet thruster as compared to the electromagnet thruster alters the electric field distribution in a way that a significant portion of the ion acceleration occurs in a defocusing electric field outside the thruster channel. A high speed imaging revealed a correlation between the electric field distribution and the occurrence of a low frequency $E \times B$ rotating spoke in the thruster discharge.

¹This work was supported by the AFOSR and the U.S. DOE under Contract DE-AC02-09CH11466.

Yevgeny Raitses

Date submitted: 22 Jul 2010

Electronic form version 1.4