Abstract Submitted
for the GEC14 Meeting of
The American Physical Society

High-energy tail formation in an ion energy distribution function in the cylindrical Hall thruster plasma YOUBONG LIM, HOLAK KIM, JAE-SUN PARK, Korea Advanced Institute of Science and Technology, JONGHO SEON, Kyung Hee University, WONHO CHOE, Korea Advanced Institute of Science and Technology — Ion energy distribution functions (IEDFs) of individual ion species having different charge states (i.e. Xe^{+}, Xe^{2+}, Xe^{3+}, etc.) in the Hall thruster plasma are obtained from the measured E × B probe spectrum by a novel inversion technique using the iterative Tikhonov regularization method. The obtained IEDFs show the existence of a high-energy tail in the cylindrical Hall thruster plasmas that is mainly due to Xe^{+} ions despite the presence of Xe^{2+} and Xe^{3+} ions with a large fraction. Ion dynamics inside the plasma was numerically investigated to demonstrate that the high-energy tail is due to nonlinear ion acceleration in the plasma oscillating at typically 100 to 500 kHz. We found that this oscillation driven by transit-time instability is responsible for the shift of the IEDF of the Xe^{+} ions toward the high-energy side, showing the formation of high-energy tail in the overall IEDF. It was also found that the Xe flow rate raised from 4 to 10 sccm increases the oscillation strength at the same frequency of 360 kHz, which can be applied to control of the shape of the IEDF.

Youbong Lim
Korea Advanced Institute of Science and Technology

Date submitted: 29 Aug 2014 Electronic form version 1.4