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Measurement of Time-Dependent Ion Velocity Distribution Function by Laser Induced Fluorescence in a Cylindrical Hall Thruster with Driven Spoke YUAN SHI, YEVGENY RAITSES, AHMED DIALLO, Princeton Plasma Physics Laboratory, STEPHANE MAZOUFFRE, ICARE-CNRS, HTX TEAM, ICARE-CNRS COLLABORATION — This paper reports, for the first time, effects of spoke on ion velocity distribution function measured by time-resolving laser induced fluorescence. To scan ion speed, the 5d 4 F -6p 4 5/2 D 5/2 transition of Xe+ is excited using tunable diode laser. Photons from 6p 4 D -6s 4 5/2 P 3/2 transition are collected by a photomultiplier tube and counted by a multichannel scaler. To subtract background, a mechanical chopper is used to generate laser pulses whose power is monitored by a photodiode. To achieve phase-locked accumulation of fluorescence photons, spoke is driven using successively phase-shifted square waves on anode segments and the driving signal is used to synchronize photon accumulation to spoke in data post processing. To resolve three ion velocity components, two laser beams are established, with one beam measuring axial velocity and the other beam measuring some linear combination of radial and azimuthal velocities, depending on the position of collection volume with respect to thruster plume. Measurements shows ion distribution function oscillates with spoke. Along the thruster axis, ion density is strongly modulated while axial ion velocities are not affected. Off-axis effects of spoke will also be discussed.

Yuan Shi
Princeton Plasma Physics Laboratory

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