Abstract Submitted
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Laser characterization of the unsteady 2-D ion flow field in a Hall thruster with breathing mode oscillations[1] ANDREA LUCCA FABRIS, CHRISTOPHER YOUNG, Stanford Plasma Physics Laboratory, NATALIA MACDONALD-TENENBAUM, WILLIAM HARGUS JR., Air Force Research Laboratory, Edwards AFB, MARK CAPPELLI, Stanford Plasma Physics Laboratory — Hall thrusters are a mature form of electric propulsion for spacecraft. One commonly observed low frequency (10–50 kHz) discharge current oscillation in these $E \times B$ devices is the breathing mode, linked to a propagating ionization front traversing the channel. The complex time histories of ion production and acceleration in the discharge channel and near-field plume lead to interesting dynamics and interactions in the central plasma jet and downstream plume regions. A time-resolved laser-induced fluorescence (LIF) diagnostic non-intrusively measures 2-D ion velocity and relative ion density throughout the plume of a commercial BHT-600 Hall thruster manufactured by Busek Co. Low velocity classes of ions observed in addition to the main accelerated population are linked to propellant ionization outside of the device. Effects of breathing mode dynamics are shown to persist far downstream where modulations in ion velocity and LIF intensity are correlated with discharge current oscillations.

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