

Abstract Submitted
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Visualization of Rotating Spoke Instabilities in a Hall Thruster

MICHAEL MCDONALD, ALEC GALLIMORE, University of Michigan — High-speed imaging of several Hall thrusters spanning an order of magnitude in discharge current has revealed an omnipresent visible rotating spoke mode, propagating at hundreds to the low thousands of meters per second in the direction of the ExB drift. An extensive software suite has been developed to facilitate image processing and visualization of these spokes in annular and cylindrical Hall thruster discharges. Modes with regular structure ranging from 2 to 5 simultaneous spokes have been observed, sometimes as single stable patterns lasting for a few seconds (the length of a typical video) and other times in a turbulent transition between several modes trading off every few milliseconds. Such azimuthal waves have long been suggested as a mechanism for cross-field electron transport, yet the visible spoke frequencies are not seen in conventional discharge current measurements. To address this disagreement we outline the design and construction of an azimuthally segmented anode capable of directly measuring rotation of the Hall thruster discharge.

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