Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Rotating plasma structures in the cross-field discharge of Hall thrusters STEPHANE MAZOUFFRE, LOU GRIMAUD, SEDINA TSIKATA, CNRS - ICARE, KONSTANTIN MATYASH, Ernst Moritz Arndt University — Rotating plasma structures, also termed rotating spokes, are observed in various types of low-pressure discharges with crossed electric and magnetic field configurations, such as Penning sources, magnetron discharges, negative ion sources and Hall thrusters. Such structures correspond to large-scale high-density plasma blocks that rotate in the EB drift direction with a typical frequency on the order of a few kHz. Although such structures have been extensively studied in many communities, the mechanism at their origin and their role in electron transport across the magnetic field remain unknown. Here, we will present insights into the nature of spokes, gained from a combination of experiments and advanced particle-in-cell numerical simulations that aim at better understanding the physics and the impact of rotating plasma structures in the ExB discharge of the Hall thruster. As rotating spokes appear in the ionization region of such thrusters, and are therefore difficult to probe with diagnostics, experiments have been performed with a wall-less Hall thruster. In this configuration, the entire plasma discharge is pushed outside the dielectric cavity, through which the gas is injected, using the combination of specific magnetic field topology with appropriate anode geometry.

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Date submitted: 09 Jun 2016 Electronic form version 1.4