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Instability-Induced Cross Field Transport in a Low Temperature Magnetic Nozzle[1] SHADRACH T. HEPNER, University of Michigan, BENJAMIN JORNS, Univ of Michigan - Ann Arbor — Magnetic nozzles consist of a converging-diverging magnetic field that supersonically accelerates a plasma to generate thrust. A central question pertaining to these devices is that of particle detachment from magnetic field lines. As charged particles tend to follow a field line, the plasma may follow the lines as they curve back towards the thruster. In low-power systems, ions tend to be unmagnetized throughout the plume. However, electrons may remain attached and follow the field lines back to the thruster, inciting electric fields that cause ions to diverge or return to the thruster as well. This effect decreases thrust production. To produce thrust, electrons must be able to separate from magnetic field lines.

This work focuses on the presence of instabilities in a magnetic nozzle and their influence on electron detachment. We measure wave propagation in three dimensions of both high and low frequencies. We further describe them theoretically and determine the anomalous collision frequency throughout the plume. We measure background plasma potential, number density, and electron temperature and discuss the influence that these waves have on electron detachment.

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