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Plume detachment from a magnetized plasma thruster ROGER BENGTSON, University of Texas at Austin — High-powered electric propulsion thrusters utilizing a magnetized plasma require that plasma exhaust detach from the onboard magnetic coils in order to produce thrust. We present experimental and theoretical results demonstrating that a sufficiently powerful plasma flow does indeed detach from a magnetic nozzle. Measurements of ion flux show a low-beta plasma plume which follows applied magnetic field until the magnetic pressure falls below the plasma energy density. The plasma flow becomes super-Alfvenic at that point and it continues ballistically downstream. Several magnetic configurations were tested including a reversed field nozzle configuration. Despite the dramatic change in magnetic field profile, the reversed field configuration yielded little measurable change in plume trajectory, demonstrating the plume is detached. Numerical simulations yield density profiles in agreement with the experimental results.

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