

Abstract Submitted
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Turbulence-induced anomalous electron diffusion in the plume of the VASIMR VX-200 CHRISTOPHER OLSEN, MAXWELL BALLENGER, JARED SQUIRE, BENJAMIN LONGMIER, MARK CARTER, TIM GLOVER, Ad Astra Rocket Company — The separation of electrons from magnetic nozzles is critical to the function of the VASIMR engine and is of general importance to the field of electric propulsion. Separation of electrons by means of anomalous cross field diffusion is considered. Plume measurements using spectral analysis of custom high frequency probes characterizes the nature of oscillating electric fields in the expanding magnetic nozzle. The oscillating electric field results in frequency dependent density variations that can lead to anomalously high transport in the absence of collisions mimicking collisional transport. The spatial structure of the fluctuating fields is consistent with turbulence caused by separation of energetic (> 100 eV) non-magnetized ions and low energy magnetized electrons via the modified two-stream instability (MTSI) and generalized lower hybrid drift instability (GLHDI). Electric fields as high as 300 V/m are observed at frequencies up to an order of magnitude above the lower hybrid frequency. The electric field fluctuations dissipate with increasing axial distance consistent with changes in ion flux streamlines as plasma detachment occurs.

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