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Evidence of Non-Classical Transport in Discharge Hollow Cathodes IOANNIS MIKELLIDES, IRA KATZ, DAN GOEBEL, KRISTINA JAMESON, Jet Propulsion Laboratory — Measurements, simplified analyses and 2-D numerical simulations with a fluid plasma model show that classical resistivity can not fully account for the elevated electron temperatures and steep plasma potential gradients measured in a discharge hollow cathode used as an electron source in electric propulsion. The numerical simulations show that classical resistivity yields much colder electron temperatures compared to the measured values in the orifice and near-plume regions of the cathode. Classical transport and Ohm's law also predict exceedingly high electron-ion relative drift speeds compared to the electron thermal speed, which would normally excite streaming instabilities in this plasma. Measurements with a high frequency emissive probe also capture 50-100 kHz plasma potential fluctuations in the near-plume region. It is found that the addition of anomalous resistivity based on existing growth rate formulae for such instabilities improves significantly the comparison between fluid theory and experiment. But the extent of possible deviations from the Maxwellian EEDF, possibly as a result of the micro instabilities, has not yet been quantified in this cathode.

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