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Direct Emission of a 200W Hall Thruster Plume DAVID LIU, RICHARD BRANAM, AFIT — Fundamental frequencies within the plasma plume of a 200-Watt Hall thruster have been measured by optical means. Although there are several studies which have tackled this area of research, none have been able to visualize the entire flow field while providing information up to 500 kHz. Time and space resolved data was determined by using a high-speed CCD camera capturing the direct emission of the plasma plume. Observations reveal the breathing mode exhibiting the temporary depletion and replenishment of excited neutrals near the exit plane of the thruster. At less than optimal operating conditions, the plasma plume exhibits azimuthal plasma structures not periodic in nature as previously believed. Moreover, the azimuthal plasma structures are not singular; rather they exist as multiple structures in the plasma plume having different angular velocities allowing them to collide with one another. This result suggests when the thruster is operating at certain conditions the azimuthal plasma structures are a combination of several modes and not just due to ionization potential of the fuel.

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