Abstract Submitted
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**Student Excellence Award Finalist: Hydromagnetic Stability and Collisional Properties of Current-Driven Plasma Jets**[1] THOMAS UNDERWOOD, MARK CAPPELLI, Stanford University — In this work, the ability to extend the operational duration of a pulsed plasma accelerator in the deflagration regime is explored. This mode generates a dense plasma jet that features distinctly high exhaust velocities, $V \sim 100$ km/s, distributed current conduction, and thus low electrode degradation rates. Along with these features however, hydromagnetic plasma jets are also susceptible to rapid instability growth and shock generation that lead to inefficient acceleration efficiency and propellant utilization. Collisionality is first described in the plasma accelerator by considering the impact of the initial neutral gas distribution within the electrode volume. Measurements indicate that neutral gas governs the transition between these operating modes and indicates regimes over which the deflagration mode can be maintained. Hydromagnetic stability is investigated by describing the underlying theory, apparatus, and optical features of a novel schlieren diagnostic capable of cinematically visualizing dense plasma jets. Dynamic coherent flow features are identified and tracked over time throughout the evolutionary progression of plasma jets. The results indicate that a stable dense plasma jet can be maintained for timescales over which a steady pinch current can be sustained.

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