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Understanding the Effect of Gas Dynamics in Plasma Gun Performance for Simulating Fusion Wall Response to Disruption Events[1] WILL RIEDEL, THOMAS UNDERWOOD, FABIO RIGHETTI, MARK CAPPELLI, Stanford University — In this work, the suitability of a pulsed coaxial plasma accelerator to simulate the interaction of edge-localized modes with plasma first wall materials is investigated. Experimental measurements derived from a suite of diagnostics are presented that focus on both the properties of the plasma flow and the manner in which such jets couple with material interfaces. Specific emphasis is placed on quantifying the variation in these properties using tungsten tokens exposed to the plasma plume as the gun volume is progressively filled with more neutral gas. These results are mapped to the operational dynamics of the gun via a time-resolved Schlieren cinematic visualization of the density gradient within the flow. Resulting videos indicate the existence of two distinct modes with vastly different characteristic timescales, spatial evolution, and plasma properties. Time resolved quantification of the associated plasma heat flux for both modes, including a range spanning 150 MW m^{-2} - 10 GW m^{-2}, is presented using both a fast thermocouple gauge and an IR camera. Both diagnostics in conjunction with a heat transfer model provide an accurate description of the energy transfer dynamics and operational characteristics of plasma guns.

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