

Abstract Submitted  
for the GEC19 Meeting of  
The American Physical Society

**Role of Neutral Gas Dynamics in Plasma Gun Devices<sup>1</sup>** THOMAS UNDERWOOD, WILLIAM RIEDEL, MARK CAPPELLI, Stanford University — Neutral gas dynamics is described in plasma accelerators by considering the impact of the initial neutral gas distribution within the gun volume. A model based on the Rankine-Hugoniot formulation in combustion is presented and used to predict both characteristic operating regimes observed experimentally. Precise neutral gas triggering is used to change the gas distribution within the accelerator and modify the initial conditions governing the breakdown process. Both bulk energy transfer and time-of-flight measurements show that with increasing gas diffusion time, the directed energy in the flow decreases and the mode transitions from a deflagration to snowplow mode. Neutral gas simulations indicate that neutral gas governs the transition between these operating modes. This informs strategies to maintain high acceleration efficiency in pulsed plasma accelerators and eliminate shocking conditions caused by higher gas loadings.

<sup>1</sup>This work is supported by the U.S. Department of Energy Stewardship Science Academic Program in addition to the National Defense Science Engineering Graduate Fellowship.

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Date submitted: 31 May 2019

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