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Numerical modeling of deflagration mode in coaxial plasma guns
HARISWARAN SITARAMAN, LAXMINARAYAN RAJA, University of Texas, Austin — Pulsed coaxial plasma guns have been used in several applications in the field of space propulsion, nuclear fusion and materials processing. These devices operate in two modes based on the delay between gas injection and breakdown initiation. Larger delay led to the plasma detonation mode where a compression wave in the form of a luminous front propagates from the breech to the muzzle. Shorter delay led to the more efficient deflagration mode characterized by a relatively diffuse plasma with higher resistivity. The overall physics of the discharge in the two modes of operation and in particular the latter remain relatively unexplored. Here we perform a computational modeling study by solving the non-ideal Magnetohydrodynamics equations for the quasi-neutral plasma in the coaxial plasma gun. A finite volume formulation on an unstructured mesh framework with an implicit scheme is used to do stable computations. The final work will present details of important species in the plasma, particle energies and Mach number at the muzzle. A comparison of the plasma parameters will be made with the experiments reported in ref. [1].

[1] F. R. Poehlmann et al., Phys. Plasmas **17**, 123508 (2010)

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