Abstract Submitted
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High-speed Schlieren visualizations of plasma pulsed jet in subsonic and supersonic regimes[1] NICOLAS BENARD, Universit de Poitiers, YANG ZHANG, Florida State University, HAOHUA ZONG, MARIOS KOTSONIS, Delft University of Technology, LOU CATTAFESTA, Florida State University, ERIC MOREAU, Universit de Poitiers — A novel type of pulsed jet using a spark discharge has been developed in recent years at PPRIME Institute. The device combines a cavity continuously fed by an external pressure source and a plasma discharge propagating from a small needle aligned with the jet orifice. The electric circuit uses a pre-ionization wave to trigger the ignition of the spark discharge. This system has been developed for flow control applications where high-frequency forcing and high momentum injection are both required. The cavity is supplied by constant air pressure at 2.4 bar, producing supersonic jet from the 1-mm diameter orifice. Subsonic conditions can also be achieved by adding a neck extension including a sudden expansion from 1 to 2 mm. In the present investigation high-speed schlieren visualizations have been conducted at a repetition rate of 100 kHz for both supersonic and subsonic operating modes. The energy released is 100 mJ/pulse, and the visualizations clearly demonstrate the strong modulation of the flow conditions from the jet orifice to the surrounding flow region. Precursor and secondary shock waves are visualized as well as the structure of the pulsed jet with a vortex ring formed in front of the jet.

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Yang Zhang
Florida State University

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