Characterization of Pulsed-power Magnetized Jets on MAIZE*

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We present the first results of a laboratory-astrophysics experiment with the goal of characterizing magnetized plasma jets on the Michigan Accelerator for Inductive Z-Pinch Experiments (MAIZE) in the Plasma, Pulsed Power, and Microwave Laboratory at the University of Michigan. We aim to explore the interactions of magnetized plasma flows with external magnetic fields and the behavior of the different plasma flows created by conical wire-arrays (hot coronal plasma and radiatively cooled jets). In these first preliminary results, we focus on the structure and development of shock instabilities.

To generate the magnetized plasma flows, we used MAIZE to ablate 100-micron, aluminum wire arrays with currents in the order of 500 Kilo-Amp with a rise time of 250 ns. We use a conical array to drive an axial plasma jet, while a Helmholtz coil provides a uniform 5-T axial magnetic field. Our first images come from visible self-emission and shadowgraphy (532 nm), captured by a fast-frame camera, showing the structure and evolution of the plasma jet.

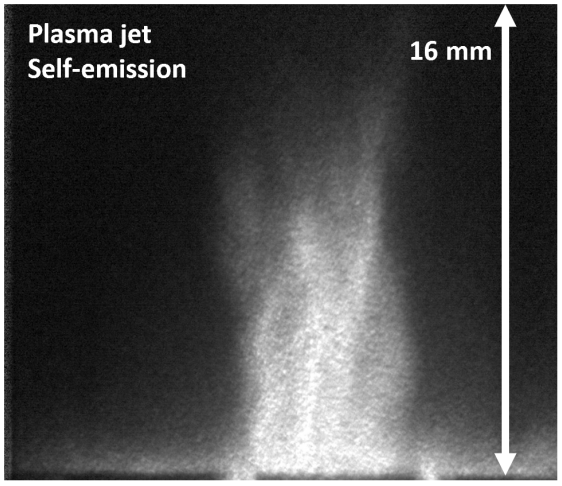

Figure 1 – Self-emission image of the aluminum plasma jet at 216 ns after pulse start. The jet is traveling at around 100 km/s and has an estimated density and temperature of 10^{-4} g/cc and 20 eV respectively.

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