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Laser-triggered millimeter-scale collimated plasma jets in crossed electric and magnetic fields. HERNAN QUEVEDO, PARRISH BRADY, PRASHANT VALANJU, MATT MCCORMACK, ROGER BENGTSON, TODD DITMIRE, University of Texas at Austin, Physics Department — Some physical aspects of astrophysical jets can be scaled to laboratory experiments using magneto hydrodynamic scaling laws. We present a laser plasma-triggered jet experiment where we produce a millimeter-scale collimated outflows from a cylindrically symmetric electrode configuration. The electrode design consists of a grounded plane with a $\sim$1 cm diameter hole and a wire aligned normally to this plane, with its tip placed at the center of the hole. A rapid discharge is formed between the wire and ground plane when a laser pulse hits an aluminum target placed above the electrodes, creating a plasma which closes the circuit. The resulting current and corresponding magnetic field give rise to a plasma jet. The jets were 0.1-0.3 cm wide, about 2 cm in length, had velocities of $\sim$20 km/s and an estimated plasma density of less than 10^{17} particles/cm^3. To study the effects of magnetic fields on jet evolution, we have embedded the plasma in axially directed permanent magnetic fields with strength up to 0.4 Tesla. We have measured the evolution of the jet over a duration of $\sim$1 μs with nanosecond resolution using a fast ICCD camera and interferometry. Under certain conditions the jets also form helical structures due to kink instabilities and the onset is characterized.

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