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Creating astrophysically relevant jets from locally heated targets irradiated by a high-intensity laser[1] HOLGER SCHMITZ, ALEX ROBINSON, Central Laser Facility, STFC Rutherford Appleton Laboratory, Didcot OX11 0QX
— The formation mechanism of jets in the vicinity of young stellar objects has been the subject of investigations for many years. It is thought that jets are formed by the stellar wind interacting with an inhomogeneous plasma. A density gradient from the equator to the poles causes the wind to encounter the inward facing reverse shock at an oblique angle. The wind is focused into a conical flow towards the poles where it emerges as a narrow jet. This mechanism is inaccessible to direct observations due to the small scales on which it operates. Using high intensity lasers to produce comparable jets offers a way to investigate the mechanisms in the laboratory. Previous investigations of jets in the laboratory have directly generated the conical flow, skipping the first part of the formation mechanism. We present simulations of a novel method of generating jets in the laboratory by using magnetic fields generated by resistivity gradients to control the fast electron flow. The return current selectively heats a small region inside the target which drives a blast wave into the low density region behind the target. A conical high density shell focuses the outflow into a narrow jet. We find jets with aspect ratios of over 15 and Mach numbers between 2.5 and 4.3.

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