Experimental study of the Richtmyer–Meshkov magnetic instability in a superalfven laser plasma flow

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The Richtmyer–Meshkov instability (RMI) is ubiquitous in nature, for example in fusion traps and inertial confinement fusion, jets and coronal mass ejections. RMI can disrupt the symmetry of compression of the fusion plasma, which can prevent ignition. To study RMI instability in magneto-inertial fusion experiments, complex x-ray diagnostics are required, which often do not provide sufficient resolution. Model experiments with a simpler setup geometry of plasma and magnetic fields have the advantage of allowing the study of the nature of the resulting instability with sufficient detail and resolution. The paper presents the results of an experimental study of superalfven plasma flows in an external magnetic field induction of about 14 T. High-speed ($v \simeq 500$ km/s) plasma flows were created as a result of irradiation by a nanosecond pump laser pulse from the PEARL laser facility. Plasma jet injection occurred both along and across the magnetic field. It was shown that during the stage of plasma confinement by a magnetic field, the Richtmyer–Meshkov instability develops and rapidly enters the nonlinear phase, allowing plasma to freely permeate across the magnetic field.