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Structure and dynamics of supersonic plasma jets, jet collisions, and their spontaneous fields C.K. LI, MIT, S.X. HU, LLE, M.J. ROSENBERG, A.B. ZYLSTRA, F.H. SÉGUIN, H.G. RINDERKNECHT, J.A. FRENJE, D.T. CASEY, M.J.-E. MANUEL, R.D. PETRASSO, MIT, P.A. AMENDT, R.P.J. TOWN, S.C. WILKS, LLNL, R. BETTI, D.H. FROULA, J.P. KNAUER, D.D. MEYERHOFER, LLE — Understanding the spatial structure and temporal evolution of plasma jets, and the interactions between colliding jets, is important for frontier astrophysics and for the basic science of high-energy-density physics. Scaled laboratory experiments have now been used to explain and quantify several important properties of supersonic astrophysical jets and their response to self-generated fields. We report the first observations of spontaneously-generated fields in jets and the effects of those fields on plasma jet propagation. Subsequent to collision of two jets with each other, low-Mach-number plasma shocks (a nonlinear consequence of plasma instabilities and fields) are observed by imaging electric fields associated with shock fronts. The shocked downstream regions lack collisional field dissipation, indicating these shocks are essentially collisionless. This work was supported in part by the U.S. DOE, LLNL, GA and LLE.

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