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Turbulent amplification of magnetic fields in colliding laboratory jets P. TZEFERACOS, U. of Chicago, J. MEINECKE, A.R. BELL, H. DOYLE, U. of Oxford, R. BINGHAM, RAL, E.M. CHURAZOV, MPIA Garching, R. CROWSTON, C.D. MURPHY, N.C. WOOLSEY, U. of York, R.P. DRAKE, C.C. KURANZ, M.J. MACDONALD, W.C. WAN, U. of Michigan, M. KOENIG, A. PELKA, A. RAVASIO, R. YURCHAK, LULI, CNRS CEA, Y. KURAMITSU, Y. SAKAWA, Osaka U., H.-S. PARK, LLNL, B. REVILLE, Queens U. Belfast, F. MINIATI, ETH Zurich, A.A. SCHEKOCHIHIN, U. of Oxford, D.Q. LAMB, U. of Chicago, G. GREGORI, U. of Oxford — Turbulence and magnetic fields are ubiquitous in the universe. In galaxy clusters, turbulence is believed to amplify seed magnetic fields to values of a few μG, as observed through diffuse radio-synchrotron emission and Faraday rotation measurements. In this study we present experiments that emulate such a process in a controlled laboratory environment. Two laser-driven plasma flows collide to mimic the dynamics of a cluster merger. From the measured density fluctuations we infer the development of Kolmogorov-like turbulence. Measurements of the magnetic field show it is amplified by turbulent motions, reaching a nonlinear regime that is a precursor to turbulent dynamo. We also present numerical simulations with the FLASH code that model these experiments. The simulations reproduce the measured plasma properties and enable us to disentangle and characterize the complex physical processes that occur in the experiment. This study provides a promising experimental platform to probe magnetic field amplification by turbulence in plasmas, a process thought to occur in many astrophysical phenomena.

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