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Spatial and Temporal Evolution of Megagauss Magnetic Fields in Petawatt Laser-Solid Interactions in the Fast Ignition Regime GOURAB CHATTERJEE, PRASHANT K. SINGH, AMIT D. LAD, Tata Institute of Fundamental Research, India, A.P.L. ROBINSON, N. BOOTH, J.S. GREEN, K.L. LANCASTER, Central Laser Facility, Rutherford Appleton Laboratory, UK, P. KOESTER, L.A. GIZZI, INO, Consiglio Nazionale delle Ricerche, Italy, R.J. GRAY, SUPA, University of Strathclyde, UK, R.J. DANCE, O. CULFA, JOHN PASLEY, N.C. WOOLSEY, York Plasma Institute, UK, G. RAVINDRA KUMAR, Tata Institute of Fundamental Research, India, P.P. RAJEEV, Central Laser Facility, Rutherford Appleton Laboratory, UK — In view of the crucial role played by the relativistic mega-ampere electron currents in mediating the energy transfer to the core of the DT fuel in fast ignition (FI), it is imperative to obtain a direct unambiguous measure of the fast electron transport, laden with the well-known filamentary instabilities. Here, we report the first direct pump-probe Cotton-Mouton polarimetric measurements of the spatial and the temporal evolution of the megagauss magnetic fields, which bear the signature of fast electron transport, generated at the rear-side of a petawatt-laser-irradiated solid target in an intensity regime (3 ps pulses at $10^{20} - 10^{21}$ W/cm^2) of direct relevance to FI. The experiment was performed at the Vulcan Petawatt laser facility. The temporal and the spatial evolution of the megagauss magnetic fields will be presented, emphasizing on the filamented beam transport to the rearside of 50 μm thick Al targets, as well as a central hollow in the rearside magnetic field profile in 50 μm thick plastic targets, previously predicted in simulations.

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