

Abstract Submitted
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Mapping magnetic fields at near-solid-densities in laser-produced plasmas using a third-harmonic probe AMIT LAD, GOURAB CHATTERJEE, PRASHANT K. SINGH, AMITAVA ADAK, P. BRIJESH, G. RAVINDRA KUMAR, Tata Institute of Fundamental Research, Colaba, Mumbai, India — Relativistic hot electrons in laser-produced plasmas are studied intensively due to their numerous applications including fast ignition. Here, we report the transport of such hot electrons in near-solid-density plasmas. Using the first, second and third harmonics as the probe, we map the self-generated giant magnetic fields starting from the critical solid density n_c up to highly overdense near-solid densities of $9n_c$, almost an order of magnitude higher. This technique is based on the change in the state of polarization of a weak, time-delayed probe pulse reflecting from the plasma created by the interaction pulse at relativistic intensities (800 nm, 30 fs, 10^{18} W/cm²). We will discuss the advantages of using an externally launched third harmonic probe over self-generated harmonics and other techniques. We will also present the coalescence of the current filaments and the localization of the magnetic fields with sub-picosecond time resolution and micron-level spatial resolution, along with its implications for the hot electron transport.

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