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Ultrafast Electron Beam Radiography of Self-Generated Magnetic Fields from High Intensity Laser-Solid Interactions[1] W. SCHUMAKER, C. MCGUFFEY, A.G.R. THOMAS, C. ZULICK, V. CHVYKOV, F.J. DOLLAR, G. KALINTCHENKO, V. YANOVSKY, A. MAKSIMCHUK, K. KRUSHELNICK, Center for Ultrafast Optical Science, University of Michigan, N. NAKANII, K.A. TANAKA, Osaka University — Using ~ 30 fs electron bunches generated with laser wakefield acceleration (LWFA) as a probe, the femtosecond temporal evolution of a $\sim 4 \times 10^{19}$ W/cm^2 short laser pulse with solid targets has been studied experimentally. Magnetic fields of ~ 100 *megagauss* were observed travelling outward from the interaction point of the laser with a 10 μm aluminum foil at nearly the speed of light under ideal laser conditions. With degraded contrast, a pre-plasma forms on the front surface, containing the front surface magnetic field to the hole-boring region. This proof-of-principle experiment demonstrates the utility of LWFA electrons as a diagnostic technique for magnetic fields with femtosecond timescale and/or in sufficiently dense plasma. These results are supported by OSIRIS particle-in-cell simulations.

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