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Spectroscopic magnetic field measurements of the drive current on the Z machine[1] S.B. HANSEN, M.R. GOMEZ, D.J. AMPLEFORD, T.J. AWE, D.E. BLISS, A.L. CARLSON, M.E. CUNEO, C.A. JENNINGS, A.J. HARVEY-THOMPSON, B. JONES, P.F. KNAPP, D.C. LAMPPA, R.D. MCBRIDE, S.A. SLUTZ, Sandia National Laboratories, D. SCHROEN, K. TOMLINSON, General Atomics — Azimuthal magnetic fields greater than 250 T (2.5 MG) have been directly measured for the first time on the Z Machine at Sandia National Laboratories through Zeeman splitting of the optical 3s – 3p absorption lines of neutral sodium. The measurements, made by aiming a streaked optical spectrometer with few-Å spectral resolution and ns-scale time resolution at a 100 ng/cm^2 Na deposit on the surface of a cylindrical target, show increasing Zeeman splitting over $\sim$ 20 ns at the foot of the 100-ns risetime current pulse. Magnetic fields greater than 1 kT could be produced at a typical initial target radius of $\sim$ 5 mm if the Z machine's nominal peak current of 27 MA is delivered to the target without loss. However, even modest current losses can significantly reduce the drive at the target and degrade its predicted performance. Validation of simulations has thus been complicated by the absence of a direct measurement of the drive current. Experiments are underway to extend the Zeeman-splitting field measurements to peak current, enabling direct measurements of the drive over the entire implosion.

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