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Magnetic flux compression experiments on the Z pulsed-power accelerator R.D. MCBRIDE, M.R. GOMEZ, S.B. HANSEN, C.A. JENNINGS, D.E. BLISS, P.F. KNAPP, P.F. SCHMIT, T.J. AWE, M.R. MARTIN, D.B. SINARS, Sandia National Laboratories, J.B. GREENLY, Cornell University, T.P. INTRATOR, T.E. WEBER, Los Alamos National Laboratory — We report on the progress made to date for diagnosing magnetic flux compression on Z. Each experiment consisted of an initially solid Be or Al liner (cylindrical tube), which was imploded using Z's drive current (0–20 MA in 100 ns). The imploding liner compresses a 10-T axial seed field, $B_z(0)$, supplied by an independently driven Helmholtz coil pair. Assuming perfect flux conservation, the axial field amplification should be well described by $B_z(t) = B_z(0) \times [R(0)/R(t)]^2$, where R is the liner's inner surface radius. With perfect flux conservation, B_z and dB_z/dt values exceeding 10^4 T and 10^{12} T/s, respectively, are expected. These large values, the diminishing liner volume, and the harsh environment on Z, make it particularly challenging to measure these fields. We report our latest efforts to do so using three primary techniques: (1) micro B-dot probes, (2) streaked visible Zeeman spectroscopy, and (3) fiber-based Faraday rotation. We will also briefly highlight some recent developments using neutron diagnostics (ratio of secondary DT to primary DD neutrons and secondary DT neutron energy spectra) to assess the degree of magnetization in fully integrated magnetized liner inertial fusion (MagLIF) experiments on Z. This project was funded in part by Sandia's LDRD program and US DOE-NNSA contract DE-AC04-94AL85000.

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