MEASUREMENTS OF MAGNETO-RAYLEIGH-TAYLOR INSTABILITY GROWTH IN SOLID LINERS ON THE 20 MA SANDIA Z FACILITY*

Daniel B. Sinars, Stephen A. Slutz, Mark C. Herrmann, Kyle J. Peterson, Michael E. Cuneo, Ryan D. McBride, John L. Porter, Roger A. Vesey
Sandia National Laboratories, Albuquerque, NM 87185 USA

Brent E. Blue
General Atomics, San Diego, CA 92121 USA

The magneto-Rayleigh-Taylor (MRT) instability is ubiquitous to pinch plasmas compressed by magnetic pressure, and is an important factor in determining whether a cylindrical liner can reach the axis in a relatively intact form. While there are many RT characterization experiments, there are few well-characterized MRT experiments and none for fast (~100 ns) z-pinch implosions in which the magnetic pressure typically quickly dominates over material strength. We will present data from our initial two campaigns to study the growth of MRT instabilities.

The first experiments on the 20 MA Z-machine in 2009 used solid Al liners with outer radii of 3.16 mm and aspect ratios (radius/thickness) of 10. The MRT instability was seeded with sinusoidal perturbations (λ=200, 400 μm, peak-to-valley amplitudes of 10, 20 μm, respectively). These wavelengths are predicted by simulations to dominate near stagnation. Radiographs from 8 different times that show the evolution of the MRT instability are compared with results from codes being used to design magnetized liner inertial fusion loads.[1]

A second set of experiments in 2010 is intended to study the growth of MRT instabilities in Be liners with aspect ratios ranging from 4 to 13.5, design values expected to be relevant for inertial fusion[1]. The field of view of the radiography will include a flat region with no perturbations other than those induced by machining and a region with 400 micron sinusoidal perturbations (20 micron peak-to-valley amplitude). The Be liners are expected to be partially transparent to 6.151 keV backlighting x rays, which will potentially allow a side-on, in-flight measurement of the stability of both the inner and outer liner surfaces.

1. S.A. Slutz, M.C. Herrmann, R.A. Vesey, A.B. Sefkow, D.B. Sinars, D.C. Rovang, K.J. Peterson, and M.E. Cuneo, *"Pulsed power driven cylindrical liner implosions of laser preheated fuel with an axial field (Invited),"* submitted for publication in Physics of Plasmas (2010).

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