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Experimental Studies of the Electrothermal and Magneto-Rayleigh Taylor Instabilities on Thin Metal Foil Ablations[1] ADAM STEINER, DAVID YAGER-ELORRIAGA, SONAL PATEL, NICHOLAS JORDAN, RONALD GILGENBACH, Y.Y. LAU, University of Michigan Department of Nuclear Engineering and Radiological Sciences — The electrothermal instability (ETI) and magneto-Rayleigh Taylor instability (MRT) are important in the implosion of metallic liners, such as magnetized liner implosion fusion (MagLIF). The MAIZE linear transformer driver (LTD) at the University of Michigan generates 200 ns risetime-current pulses of 500 to 600 kA into Al foil liners to study plasma instabilities and implosion dynamics, most recently MRT growth on imploding cylindrical liners. A full circuit model of MAIZE, along with I-V measurements, yields time-resolved load inductance. This has enabled measurements of an effective current-carrying radius to determine implosion velocity and plasma-vacuum interface acceleration. Measurements are also compared to implosion data from 4-time-frame laser shadowgraphy. Improved resolution measurements on the laser shadowgraph system have been used to examine the liner interface early in the shot to examine surface perturbations resulting from ETI for various seeding conditions. Fourier analysis examines the growth rates of wavelength bands of these structures to examine the transition from ETI to MRT.

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