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Cylindrical Liner Z-pinch Experiments on the MAGPIE Generator GUY BURDIAK, SERGEY V. LEBEDEV, Imperial College London, ADAM J. HARVEY-THOMPSON, Sandia National Laboratories, GEORGE F. SWADLING, FRANCISCO SUZUKI-VIDAL, JONATHAN SKIDMORE, LEE SUTTLE, ESSA KHOORY, LOUISA PICKWORTH, PHILIP DE GROUCHY, GARETH N. HALL, SIMON N. BLAND, MARCUS WEINWURM, JEREMY P. CHITTENDEN, Imperial College London — Experimental data from gas-filled cylindrical liner z-pinch experiments is presented. The MAGPIE current (1.4 MA, 240 ns) is applied to a thin walled (80um) Al tube with a static gas-fill inside. The system is diagnosed axially using interferometry, optical streak photography and optical spectroscopy. We observe a series of cylindrically converging shock waves driven into the gas-fill from the inside liner surface. No bulk motion of the liner occurs. The timing of the shocks and their trajectories provide information on the shock launching mechanisms. This in turn allows a study of the response of the liner to the current pulse. Shock wave timing is compared to measurements of the liner resistance and optical images of the liner's outside surface. The system provides a useful, essentially 1D problem for testing MagLIF relevant MHD codes, particularly with regards to EOS, strength and resistivity models. This work may also be relevant to the study of shocks in astrophysical plasmas. The shocks launched into the gas radiatiate strongly; spatially resolved optical spectroscopy data and radial electron density profiles from interferometry images provide evidence for a radiative precursor ahead of the first shock. Instabilities are seen to develop in the downstream regions.

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