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Operation of Two-stage Wire Array Z-pinches on the Magpie Generator JIAN WU, Xi'an Jiaotong University, GUY BURDIAK, S. LEBEDEV, A. HARVEY-THOMPSON, G. HALL, G. SWADLING, F. SUZUKI-VIDAL, S. BLAND, L. SUTTLE, Imperial College London, E. WAISMAN, SNL, G. WANG, Q. YANG, Xi'an Jiaotong University — We describe the operation of two-stage wire array z-pinches driven by the 1.4MA, 240ns Magpie generator at Imperial College. In this setup, an inverse wire array acts as a fast current switch, delivering a 20ns, 5kA current pre-pulse into a cylindrical load array, before rapidly switching the majority of the generator current into the load after a 100ns dwell time. Measurements of load resistivity and energy deposition during the pre-pulse suggest significant bulk heating of the array mass occurs, leaving it in a mixed liquid-vapour state. Preconditioning of the load dramatically alters the ensuing implosion dynamics; the ablation phase is eliminated, together with trailing mass during the final implosion. The main current switch occurs as the inverse array explodes and plasma expands into the load region. Electrical and imaging diagnostics indicate that the main current switch may evolve as a plasma flow switch, driven by the expansion of a magnetic cavity along the length of the load array. Analysis of implosion trajectories suggests that approximately 1MA switches into the load in 100ns, corresponding to a doubling of the generator dI/dt. Attempts to measure the current profile throughout the current switch will be presented. In addition, we present results from preconditioned x-pinch experiments, and attempts to perform point projection radiography of preconditioned single wires by fielding an x-pinch in parallel with a two-stage array.

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