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Characterisation of the Current Switch Mechanism in Two-stage Wire Array Z-pinches GUY BURDIAK, S. LEBEDEV, A. HARVEY-THOMPSON, G. HALL, G. SWADLING, F. SUZUKI-VIDAL, S. BLAND, L. PICKWORTH, P. DE GROUCHY, L. SUTTLE, Imperial College London, E. WAISMAN, Sandia National Laboratories — We describe the operation of a two-stage wire array z-pinch driven by the 1.4 MA, 240 ns rise-time Magpie generator at Imperial College London. In this setup an inverse wire array acts as a fast current switch, delivering a current pre-pulse into a cylindrical load wire array, before rapidly switching the majority of the generator current into the load after a 100-150 ns dwell time. Preconditioning of the load array dramatically alters the ensuing implosion dynamics; the ablation phase is eliminated and no trailing mass remains at the initial array radius during the final implosion. The main current switch occurs as the inverse array begins to explode 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 and plasma bubble along the length of the load array. Analysis of implosion trajectories suggests that approximately 1 MA switches into the load in 100 ns. Attempts to measure the current profile throughout the current switch will be presented. Potential scaling of the device to higher current machines is discussed.

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