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On the scaling of the magnetically accelerated flyer plate technique to currents greater than 20 MA[1] R.W. LEMKE, M.D. KNUDSON, K. COCHRANE, M.P. DESJARLAIS, J.R. ASAY, Sandia National Laboratories — In this talk we discuss scaling the magnetically accelerated flyer plate technique to currents greater than are available on the Z accelerator. Peak flyer plate speeds in the range 7-46 km/s are achieved in pulsed power driven, hypervelocity impact experiments on Z for peak currents in the range 8-19 MA. The highest (lowest) speeds are produced using aluminum (aluminum-copper) flyer plates. In either case, the ≈1 mm thick flyer plate is shocklessly accelerated by magnetic pressure to ballistic speed in ≈400 ns; it arrives at the target with a fraction of material at standard density. During acceleration a melt front, due to resistive heating, moves from the drive-side toward the target-side of the flyer plate. The speed of the melt front increases with increasing current. Peak flyer speeds on Z scale quadratically (linearly) with current at the low (high) end of the range. Magnetohydrodynamic simulation shows that the change in scaling is due to geometric deformation, and that linear scaling continues as current increases. However, the combined effects of shockless acceleration and resistive heating lead to an upper bound on the magnetic field feasible for pulsed power driven flyer plate experiments, which limits the maximum possible speed of a useful flyer plate to <100 km/s.

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