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A new strip-line design for multi-megabar dynamic loading experiments on the Z-machine¹

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The challenges associated with isentropically compressing material samples to multi-megabar pressures in experiments on the refurbished Z accelerator (ZR) are discussed. Due to the higher stored energy on ZR relative to Z, the peak current delivered to a low inductance (~ 1.3 nH) flyer load has increased by a factor of ~ 1.3 to ~ 26 MA. It should be possible to achieve peak pressures of ~ 10 Mb in dynamic ramps for isentropic compression experiments (ICE), and shockless acceleration of flyer plates. We have developed a new strip-line load for dynamic materials experiments on ZR that increases the drive pressure relative to what was possible with the rectangular slab loads used exclusively on Z. The isentrope of Ta has been measured to 4 Mb using a strip-line load. Predictive MHD simulations of the strip-line have been performed to characterize this load and to scope out designs for flyer plates and ICE that utilize the full pressure available on ZR; results indicate that a peak flyer velocity of ~ 40 km/s is possible. We discuss these results and related experiments.

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