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Investigation of shock damage from x-pinch wire loads[1] BEN HAMMEL, TIM DARLING, University of Nevada at Reno — In x-pinch experiments on the Nevada Terawatt Facility's 1-MA pulsed power machine (Zebra), significant damage of the anode has been observed. Post shot analysis shows scabbing at the free-surface as well as multiple spall layers. This damage is a result of a strong shock - generated by several factors: (1) a rapid deposition of energy from ballistic electrons impacting the sample, resulting in ablation of material; (2) ablation from the impact of a high Mach-number plasma jet - formed from the implosion of the x- pinch wire array; (3) magnetic pressure resulting from the electrical current flowing across the surface of our target, perpendicular to the induced magnetic field. We are currently preforming experiments to characterize the mechanisms responsible for this shock generation, and investigating the material state as a result of shock-compression of this type. Free-surface velocities as high as 2 km/s in 2, 3, and 4-mm-thick Copper targets have been recorded using a Line-VISAR (Velocity Interferometer System for Any reflector). The time-profile of the drive is characterized by the hard x-ray (100 keV -1 MeV) emission resulting from the bremsstrahlung radiation due to the impact of electrons with the target. We see that damage is a strong function of x-pinch wire material, and not correlated to the linear mass of the x-pinch load. The feasibility of using this drive type as a method for shock-physics experiments is also discussed.

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