SHOCK WAVE EQUATION OF STATE EXPERIMENTS AT MULTI-TPA PRESSURES ON NIF*

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The National Ignition Facility provides an unprecedented capability to generate steady, planar, ultra-high pressure shock waves (around 10 TPa) in solid samples. Building on successful laser shock equation of state experiments performed on a variety of other laser facilities, we have designed and fielded experiments to perform impedance match experiments on samples of C, Be, SiO_2 and CH, in the range of 3 to 7 TPa. The samples under study are of particular relevance to the inertial fusion program, because they include the three capsule ablator materials current employed in capsule performance studies. The principal Hugoniot, accessible with shock wave experiments, represents an important benchmark for testing and constraining the tabular equation of state models currently in use in the design codes used for integrated target designs.

The experiments use a line-imaging VISAR as the primary diagnostic to measure the shock velocity in an Al reference standard and in an array of the four samples. Initial tests with the line-imaging VISAR show that the NIF is capable of driving shocks that are steady to better than 2% in velocity for several ns, with smooth planar breakout patterns over a 2 mm diameter spot. These results matched design calculations carried out before the tests. Initial results will be discussed.

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