Abstract Submitted
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Absolute equation of state and opacity measurements of CH plastic to 40 TPa using the National Ignition Facility[1] T. DOEPPNER, D.C. SWIFT, J.A. HAWRELIAK, A. KRITCHER, G.W. COLLINS, S. GLENZER, Lawrence Livermore National Laboratory, S.D. ROTHMAN, D. CHAPMAN, AWE Aldermaston, J. GAFFNEY, S. ROSE, Imperial College, London, R. FALCONE, University of California - Berkeley — We have developed an experimental configuration using a hohlraum-driven spherically-convergent shock to induce pressures into the gigabar range, measuring the Hugoniot radiographically. The shock pressure increases with convergence, so a range of Hugoniot states is obtained from a single experiment. The opacity along the Hugoniot is also deduced, which is essential in gigabar experiments as it changes significantly from its initial value. We are focusing initially on plastics, as we can reliably obtain spherical samples with the desired design of ablator, and the radiographic signal is reasonable. Our initial measurements on NIF used a conservative timing of the x-ray backlighter to allow for uncertainty in the EOS, and probed only part of the pressure range. The shock speed and compression, obtained from radiographic analysis, gave absolute Hugoniot states from 12-41 TPa, which is an order of magnitude greater than previously measured in CH. The measured EOS locus was consistent with the previous measurements, and significantly stiffer than the theoretical EOS used for comparison. Our analysis also gave the variation of opacity along the Hugoniot, which showed a decrease of an order of magnitude, as expected from atomic physics calculations.

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