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Equation of state measurements of CH plastic at Gbar pressures using the National Ignition Facility¹ TILO DOEPPNER, A. KRITCHER, D. SWIFT, J. HAWRELIAK, G. COLLINS, C. KEANE, O. LANDEN, T. MA, S. LE PAPE, Lawrence Livermore National Laboratory, H.J. LEE, S. GLENZER, SLAC, P. NEUMAYER, GSI, D. CHAPMAN, S. ROTHMAN, AWE plc, R. FALCONE, UC Berkeley — We have used the National Ignition Facility (NIF) to conduct absolute equation of state and opacity measurements of plastic CH along the principal Hugoniot at unprecedented pressures, approaching 1 Gbar. A 5 ns long, 1.3 MJ laser pulse at 351 nm, generating a hohlraum drive with 290 eV peak radiation temperature, launches a strong shock wave into a 2.2 mm diameter plastic ball. The induced pressures by the spherical shock wave increase as the shock converges, accessing a range of Hugoniot states in a single experiment. We measure compression from the radiography contrast at the shock front with a powerful Zn He-alpha backlighter. The opacity along the Hugoniot is also deduced, which is essential as it changes significantly from its initial value. We will present results of first NIF experiments where we obtained absolute measurements of Hugoniot states from 120-650 Mbar, which is an order of magnitude greater than previously measured in CH (Cauble et al., PRL 1998). The measured EOS locus is consistent with previous data, and significantly stiffer than the theoretical EOS used for comparison.

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