Abstract Submitted
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Evidence of multi-petapascal pressures in converging shock compression of deutero-polyethene at the National Ignition Facility[1] B.-L. BACHMANN, J. NILSEN, A.L. KRITCHER, T. DOEPPNER, D.C. SWIFT, G.W. COLLINS, LLNL, S. GLENZER, SLAC, D. KRAUS, R.W. FALCONE, UC-Berkeley — A converging shock was induced in a sphere of deuterated polyethene using a hohlraum x-ray drive at the National Ignition Facility. A CH ablator was deposited over the sample, including a Ge-doped radiographic marker layer near its inner edge. Density and opacity profiles were deduced from streaked x-ray radiography, giving a measurement of the shock Hugoniot from 10-80 TPa. As the shock reached the center of the sample, intense x-rays and neutrons were produced, detected with x-ray cameras and neutron scintillators respectively. Penumbral imaging of the x-ray flash showed that shock convergence was spherical to 20 percent or better. The neutron time-of-flight record showed a well-resolved D-D peak, and also a lower D-T peak from tritons produced in the D-D reactions. The x-ray and neutron signals were in very encouraging agreement with radiation hydrodynamics simulations. Analysis of the peak shapes and comparison with the simulations indicates that reaction-averaged temperatures in the hotspot were in the kilovolt range with pressures of several petapascals (tens of gigabars). The hotspot can provide valuable insight on the limits of shock compression before transport perturbs the state ahead.

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