Abstract Submitted
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Astrophysical experiments at a gigabar on the National Ignition Facility[1] A. KRITCHER, D.C. SWIFT, T. DOEPPNER, J.A. HAWRELIAK, J. EGGERT, G.W. COLLINS, S. GLENZER, Lawrence Livermore National Laboratory, R. FALCONE, University of California - Berkeley, P. NEUMAYER, GSI Darmstadt — We have now demonstrated a capability at NIF to produce accurate equation of state (EOS) measurements on matter into the gigabar regime. Work so far has focused on CH, but with further development it will be possible to study other materials, in particular of higher Z. As well as being relevant to high-pressure engineering systems such as inertial confinement fusion, we can address key problems in astrophysics. Gigabar-scale pressures occur within massive exoplanets, and experimentally-constrained EOS measurements are essential to interpret exoplanet observations in terms of internal structures. This research provides important constraints for assessments of dark matter, by improving estimates of the total amount of baryonic mass for a given density of luminous (stellar) mass, because the ratio of non-luminous to luminous mass depends on the upper mass limit of brown dwarfs, which depends sensitively on the EOS. We are also able in NIF experiments to deduce the opacity along the shock Hugoniot, which is a necessary component in studies of stellar structure and evolution.

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