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Development of quasi-isentropic drives to 500 GPa and beyond
SHON T. PRISBREY, HYE-SOOK PARK, BRIAN MADDOX, BRUCE REMINGTON, ROBERT CAVALLO, MARK MAY, TOM ARSENLIS, Lawrence Livermore National Laboratory — The ability to reliably measure materials at energy densities exceeding $5x10^{11}$ J/m^3 (500 GPa) requires an experimental platform that reaches such energy densities in a controlled manner and in a configuration that allows measurements to occur. We have developed a staged shock drive that will quasi-isentropically ramp materials such as Ta and Mo into such a high energy density state and simultaneously keep the materials substantially below their melting point, i.e., in their solid phase. Recent measurements of our platform on the National Ignition Facility have confirmed our ability to predict the resultant drive with a peak pressure of ∼500 GPa. Separate experiments at the same facility have recently demonstrated that a drive with peak pressures >800 GPa is possible. We will show the experimental platform, the simulated and measured drives produced by the platform for ∼500 GPa and ∼800 GPa drive shots. We will also show an experimental platform which utilizes the drive and measurements of the samples to infer material strength. This work was performed under the auspices of the Lawrence Livermore National Security, LLC, (LLNS) under Contract No. DE-AC52-07NA27344. LLNL-ABS-620612

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