

Designs for dynamic loading experiments in the massive exoplanet regime

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Exoplanets have been detected with masses and radii suggesting rocky and hydrogen-rich compositions up to ~ 10 times the mass of the Earth and Jupiter, in similar volumes. The formation and evolution of such bodies, and the distribution and properties of brown dwarfs which are an important component of galactic structures, depend on the equation of state (EOS) and chemistry of constituent matter at pressures ~ 2 -200 TPa for Fe-rich and hydrogenic matter respectively. Electronic structure calculations can predict these properties, but experimental measurements are crucial to investigate their accuracy in this regime. Hohlraum-driven configurations at the National Ignition Facility can induce planar ramp or shock loading to ~ 30 TPa, over volumes sufficient to enable \sim percent accuracy in EOS measurements. We are designing configurations using convergent ramp and shock loading for EOS experiments to pressures in excess of 100 TPa.