Abstract Submitted
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Laser-induced Mach waves for ultra-high-pressure experiments[1]
DAMIAN SWIFT, Los Alamos National Laboratory — Laser-driven experiments are a principal technique for inducing pressures in the terapascal regime and higher. However, when high irradiance laser light interacts with matter, it generates fast electrons and x-rays, which may heat material ahead of hydrodynamic loading waves such as shocks. This preheat limits the scope for investigating properties of initially cold material and potentially reduces the accuracy of measurements. A new configuration for laser experiments is proposed, using convergence and irregular reflection of shocks to induce high pressures without such high laser irradiances. Related Mach wave generators have been developed previously for high- explosive drive; the design considerations for laser-driven Mach wave generators are typically dictated by constraints on the laser pulse duration and differ from high-explosive systems. Relations are presented between the pressures achievable with different variants of the laser drive technique and different combinations of materials in the Mach-interaction region. The prospects for isentropic compression using this type of experiment are discussed.

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