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Using X-Ray-Driven Shocks to Mitigate Laser Imprinting in a Novel Hybrid Design for Direct-Drive Laser Fusion[1]

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A novel target design for mitigating laser imprint and subsequent Rayleigh-Taylor growth is presented for use in high-energy-density and direct-drive inertial-confinement-fusion experiments. In this scheme, a thin gold membrane is offset from the main target by several hundred microns. A strong picket on the drive beams is incident upon this membrane to produce x rays which generate the initial shock through the target. The main drive follows shortly thereafter, passing through the ablated shell and directly driving the main target. The efficacy of this scheme is demonstrated in planar geometry through experiments performed at the OMEGA EP facility, showing an exponential-in-frequency reduction of the Rayleigh-Taylor instability growth, suppressing development by at least a factor of 5 for all wavelengths below 100 μm. The next phase of research is focused on fielding a target in spherical geometry using a cone-in-shell configuration. The status of its development and the additional benefits resulting from such a geometry are discussed.

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