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Fuel Assembly for Fast Ignition Inertial Confinement Fusion R. BETTI, C. ZHOU, Fusion Science Center for Extreme States of Matter and Fast Ignition Physics, Laboratory for Laser Energetics, U. of Rochester — Large densities and areal densities (ρR) of compressed thermonuclear fuel lead to high gains and low ignition energies in fast-ignition inertial confinement fusion. It is well known that high densities and high ρR can be achieved by driving the imploding shell on a low adiabat. However, low adiabat pulses are difficult to realize in practice because of the extreme contrast ratio between peak and foot laser power. A recent advancement in direct-drive pulse design has provided a pulse shape that mitigates the power contrast ratio and enhances the ablative stabilization of the RT instability while driving the capsule on a very low adiabat. The laser pulse, referred to as the relaxation (RX) pulse design, consists of a short prepulse followed by a power shutoff and the main laser pulse. Massive cryogenic shells can be imploded with a low implosion velocity on a low inner adiabat with an RX pulse. The low velocity and the shaped adiabat also prevent a significant growth of the RT instability. Target designs for a 25-, 100-, and 750-kJ driver are presented. One-dimensional simulations show fuel assemblies with ρR of 0.7–3 g/cm^2 and peak densities of 400–700 g/cc obtained with implosion velocities of 1.7–2.5 $\times$ 10^7 cm/s This work has been supported by the U.S. DOE under Cooperative Agreements ER54789 and DE-FC03-92SF19460.

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