

For submission to the APS/DPP press releases, David D. Meyerhofer, University of Rochester

Solution to a direct-drive inertial confinement fusion target designer's dilemma

The performance of a direct-drive inertial confinement fusion target is determined by the shock-wave-induced pressure in the deuterium-tritium(DT) ice shell. At higher pressures, the imploding DT shell is more stable but the final fuel density and gain are limited by shock heating in the core. At lower pressures, the DT shell is less stable but the predicted final fuel densities and gain are much higher. Traditionally, the target designer has had to choose an intermediate value of pressure to balance the shell stability and target gain. Because the stability is determined in the outer regions of the shell and the gain in the inner region, a potential solution to this dilemma is to tailor the pressure profile within the shell using an advanced pulse shape. This solution is being developed at the University of Rochester's Laboratory for Laser Energetics. A short "picket" pulse, placed at the beginning of the original laser pulse, launches a decaying shock wave into the target leaving the outer region at higher pressure than the inner region, allowing both improved stability and high gain. Complementary techniques have been developed at other institutions. The "picket" solution has been implemented in LLE's ongoing experiments with significant improvements in target performance. These results will be discussed in an invited talk by Dr. V. Goncharov (talk number RI1.004). For further information contact Dr. R.L. McCrory (rmcc@lle.rochester.edu, 585-275-5286) or Dr. D.D. Meyerhofer (ddm@lle.rochester.edu, 585-275-0255).

Figure: 2-D simulations with and without picket.