
On-Shot Focal-Spot Characterization in the OMEGA Target Chamber

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LLE is developing a diagnostic to measure the on-shot, on-target fluence of OMEGA beams at the target chamber center. The diagnostic will provide a direct measurement of the focal spot at full energy, calibrated using a calorimeter mounted in the opposing port of the target chamber. The diagnostic will be TIM-based and have access to 51 different OMEGA beams (one at a time). We estimate that aberrations introduced by the diagnostic will be less than the current system aberrations. The diagnostic aberrations will have a minimal effect on the DPP focal spot, which is of primary interest for experiments. Diagnostic assembly is complete and first shots on OMEGA will be in June 2018.

OMEGA currently measures the on-shot pulse power for 50 laser spots upstream of the target chamber. A wedged vacuum window will provide a sample of the full-energy OMEGA beams. The diagnostic will be brought into the target chamber in a Neutron-Induced-Neutron (TIM) diagnostic package.

There are significant discrepancies among various estimates of OMEGA's output intensity. There is only a marginal improvement in the measured fluence when the laser is fired in a helium gas puff. OMEGA laser diagnostics are located upstream of the target chamber and measure the on-target fluence. Experimental results suggest that the intensity balance on target is different than that predicted by laser diagnostics. This diagnostic will provide a direct measurement of the focal spot at full energy.

The diagnostic configuration provides a high-field line focus on the TIM. The TIM diagnostic package, the diagnostic calibration, and the TIM diagnostic package are complete. OMEGA implosions use a DPP.