

TARGETS FOR REP-RATED HIGH-ENERGY-DENSITY SCIENCE EXPERIMENTS AT LCLS¹

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General Atomics Inertial Fusion Technology (IFT) division has provided fully-assembled targets, target components and advice for many rep-rated high energy density (HED) science experiments performed at the Matter in Extreme Conditions (MEC) end stations of the SLAC Linac Coherent Light Source (LCLS). High power optical lasers used to drive the HED targets prior to probing with the LCLS x-ray beam have sufficient energy to damage the target in one shot. This necessitates large numbers of targets for experiments (~100 s to 1000 s) for a typical campaign; especially to take advantage of the high shot rate available at LCLS.

Targets for accessing HED parameters often require precision geometry and novel materials. IFT's extensive target fabrication experience allows a rapid development and integration of new techniques and tools to meet the challenge. We have worked closely with the experimental campaign leaders to guide the target design and have produced a wide array of routine and first-of-a-kind targets for over 15 HED science experiments at LCLS. In this presentation, we will illustrate a number of developments on target mass-production, precision coating and machining, processing hard-to-handle materials including lithium and sodium, and advanced precision assembly by robotics. Those capabilities are critical for producing large numbers of targets at a reasonable cost for rep-rated HED experiments. Recent deliveries of novel targets and their uses in unique LCLS HED science experiments will be discussed. The results are also relevant to the target development for other existing and soon-to-be-available high-repetition rate laser and x-ray facilities worldwide.

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