Shock-Related Structure in D-^{3}He Proton Spectra: Proton spectra from 20-μm-thick plastic shells filled with deuterium (D) and helium (^{3}He) have been measured using the OMEGA charged-particle spectrometers (CPS1 and CPS2) and an array of wedged range filter spectrometers. The capsules were irradiated with a 1-ns square laser pulse with ~23 kJ of energy. The measured proton spectrum (red) and the simulated spectrum (black) for a target filled with 15 atm of D-^{3}He are shown in Fig. 1. The one-dimensional (1-D) simulation of the experiment using the hydrodynamics code *LILAC* was postprocessed with the Monte Carlo particle-tracking code *IRIS* to obtain the simulated proton spectrum. Since these energetic protons exit the target relatively quickly, their downshift from their birth energy of 14.7 MeV is essentially a measure of the areal densities in the implosion at the time of their emission. The difference in the peaks of the proton spectra suggests that the areal density at peak proton production is higher in the simulation than in the experiment. Of particular interest is the high-energy shelf in the proton spectra. Passage of the reflected shock from the center and through the gas fill results in a peak in proton production that in turn results in this shelf. The very similar downshifts of the simulated and measured spectra suggest that the areal density in the implosion closely corresponds to the 1-D value during this phase of the implosion.

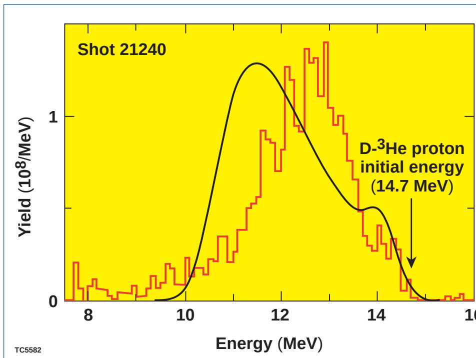

Figure 1. Measured (red) and simulated (black) proton spectra for a 20-μm-thick, 969-μm-diameter CH shell filled with 15 atm D^{3}He and irradiated with 22.8 kJ of UV energy. The 1-D calculation has been scaled by the ratio of the experimental to 1-D proton yields.

NIF 2-D SSD Preliminary Design: As a partner in the National Inertial Confinement Fusion (ICF) Program, LLE has taken a lead role in defining direct-drive requirements for NIF and preparing a preliminary 2-D SSD system design to meet the beam-smoothing requirements. A prototype NIF 2-D SSD preamplifier module (PAM) will be built and tested in the Laser Development Laboratory at LLE to demonstrate satisfactory performance before transferring it to LLNL, where it will be integrated into the PAM Laboratory. Figure 2 represents the recently completed preliminary design of the regenerative amplifier side of the PAM, in which a 2-D SSD module (highlighted in yellow) can be realized. A key aspect of this design is that the regenerative amplifier and beam-shaping module (BSM) are unchanged, and only minor changes to the existing isolation stage and diagnostic pickoffs are required to provide adequate space for the 2-D SSD module. The isolation Pockels cells are reoriented and more compactly arranged to free up space for both the G2/G3 grating telescope at the bottom of the PAM and the main section of the 2-D SSD module located adjacent to the BSM. Additionally, the centering glass (RC1), diagnostic wedge (RS1), and folding mirror (RM8) assemblies are reconfigured to further increase the space envelope available for the 2-D SSD module.

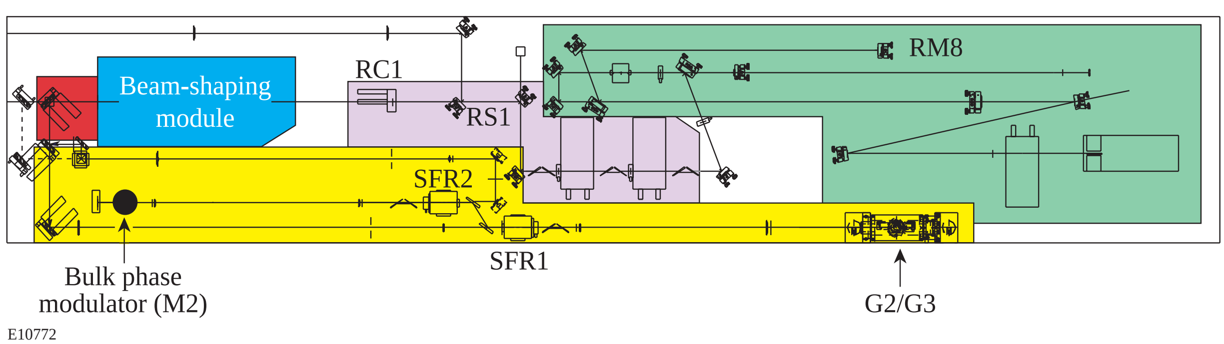

Figure 2. Preliminary NIF 2-D SSD PAM design. The detailed design of some of the system components is continuing.

OMEGA Operations Summary: At the beginning of January the OMEGA system was configured for a week of spherical implosions. During the ensuing experimental campaign, the target performance was consistent with the power-balanced results from ISE campaigns in the fall of 2000. Several days of LLE SSP shots were interspersed with LPI and diagnostic development tests to qualify a new hard x-ray spectrometer and ASBO laser diagnostic system. The week of 22 January was dedicated to quarterly maintenance, during which many diagnostic systems were overhauled and the ASBO diagnostic upgraded. In total there were 84 target shots for several LLE experimental campaigns during January.

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