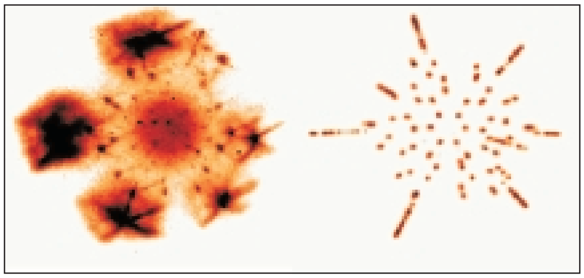
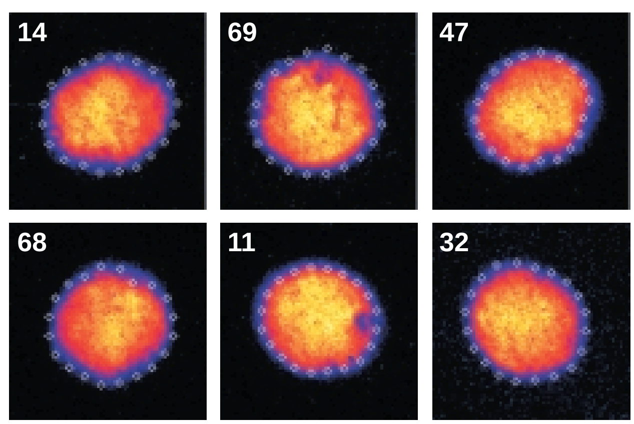
Time-Integrated UV Photographs of OMEGA Implosions: Time-integrated photographs of OMEGA targets typically show many features that have previously defied detailed explanation. Recently, UV photographs of imploding spherical targets were simulated using 1-D *LILAC* density and temperature profiles. A postprocessor uses the profiles to perform ray tracing and absorption. Tracing rays from each beam to the camera lens creates simulated images that are found to be in close agreement with experimental photographs. The simulations show that beams are both reflected from the front of the target and refracted from behind the target into the camera lens. In this way all 60 laser spots are visible in both the simulated and actual photographs. Further, the simulation provides time resolution, showing that most of the image is created within the first 200 ps by reflection from the newly forming plasma. After ~200 ps, the plasma is established and absorption dominates. An exception to this is the set of six beams almost directly opposite the camera, which are refracted through the outer, low-density layers of plasma and are clearly visible for as long as 1.1 ns. This results in the severe film overexposure seen in the outer region of the actual photographs. The simulations will most likely be adapted for other potential uses.



E11231

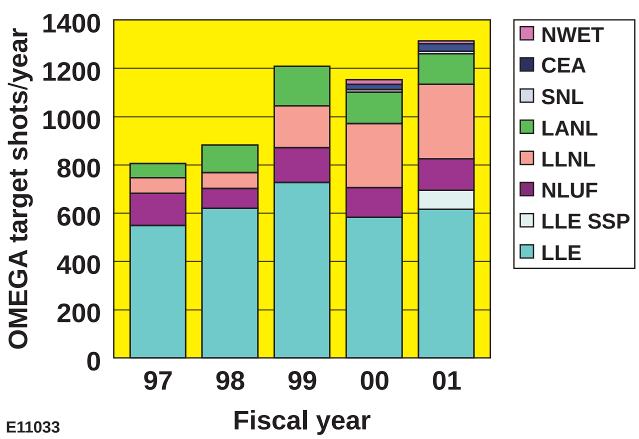
Figure 1. UV photograph of imploding target (left) and simulated time-integrated image (right).

OMEGA Operations Summary: The month of September included six campaigns. LLNL and NLUF shared a week between shock sphere (12 shots) and supernova Rayleigh–Taylor (11 shots) experiments, and an LLE-conducted characterization of new distributed phase plates (3 shots). These new diffractive optics make smooth circular spots for beams obliquely incident on planar-foil targets (see Fig. 2). Several categories of shots were taken under the LLE Integrated Spherical Experiments Campaign (19 shots), as well as two days of LLE-SSP shots (22 shots). The shot schedule for LLNL and LANL shots was disrupted due to the terrorist attacks on NYC and Washington, DC. Some of the system time was used to conduct cryogenic system testing and laser tuning and an LLE investigator filled in to conduct a LANL double-shell implosion series (12 shots). The monthly total of 79 shots brings the FY01 grand total to 1291 target shots. This includes 607 target shots for external users (including the national laboratories and NLUF), 605 shots for the LLE ICF campaigns, and 79 shots for LLE experiments in support of the National Stockpile Stewardship Program (SSP). Figure 3 shows that OMEGA has increased its target shot rate from ~800 shots per year in FY97 to its current record of 1291 shots in FY01.



U263

Figure 2. OMEGA beam spots imaged normal to a planar target from beams (beam number shown next to image) incident on target at a 48° angle of incidence. These beams had DPP's designed to compensate for the beam ellipticity (maximum radius/minimum radius) that would normally be produced at such an angle of incidence (~1.5). The six beams shown in the image were observed to have an average ellipticity of ~1.09. The diamond shapes are placed on the images during image processing to locate the edges of the beams. The largest ellipticity (1.14) was exhibited by beam 47.



E11033

Figure 3. OMEGA target shot history from FY97 to FY01.

Contact: Wolf Seka (716) 275-3815; fax: (716) 275-5960; e-mail: seka@lle.rochester.edu
John M. Soures (716) 275-3866; fax: (716) 256-2586; e-mail: jsou@lle.rochester.edu