Implementation of a New Neutron Temporal Diagnostic: The neutron temporal diagnostic (NTD) measures the fusion-reaction-rate history of neutrons emitted from DT- and D_2-filled targets. The neutron burn width is an important measure of confinement and is used to infer pressures exceeding 30 Gbar in cryogenic DT implosions. During June, the OMEGA NTD was replaced with a new ROSS streak-camera–based system. The impulse response of the ROSS-based system will be better characterized, reducing the uncertainty in the inferred cryogenic implosion pressures. The instrument is based on the fast rise time of a commercially available plastic scintillator. Neutron collisions with the scintillator convert neutron kinetic energy to 350- to 450-nm-wavelength light. The scintillator is shielded against hard x rays using a high-*Z* Hevimet nose cone (see Fig. 1). The light is collected and transported by an optical system to the photocathode of a fast streak camera, whose output image is recorded by a charge-coupled–device camera. Simultaneously recorded laser fiducial pulses provide absolute timing for the NTD neutron signal. To determine the absolute time calibration, the Hevimet nose cone is removed and replaced with an aluminum nose cone to measure hard x rays from a calibration target.

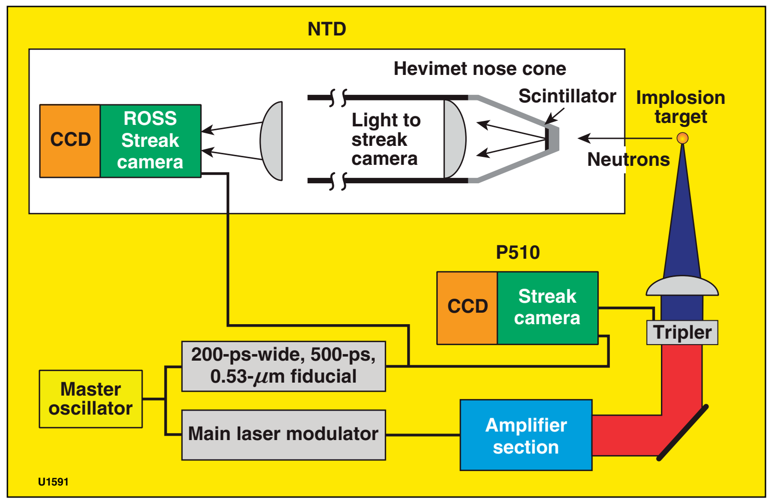

Figure 1. Setup of the neutron temporal diagnostic (NTD). CCD: charge-coupled device; P510: P510PSU streak tube.[1]

The original NTD, which was previously deployed on the Nova laser at Lawrence Livermore National Laboratory, could no longer be maintained. It was replaced with more- modern components, including a new ROSS streak camera, a new optical relay system, and a new motion-control system for the scintillator nose cone. Figure 2(a) shows the installation of the new nose-cone assembly into the target chamber. This new assembly makes it possible to change out nose cones without a target chamber entry, which will facilitate more frequent NTD calibration. Figure 2(b) shows the complete NTD installation with the nose-cone assembly mounted to the target chamber, the black optical relay box, and the high-density, polyethylene-shielded housing for the ROSS streak camera.

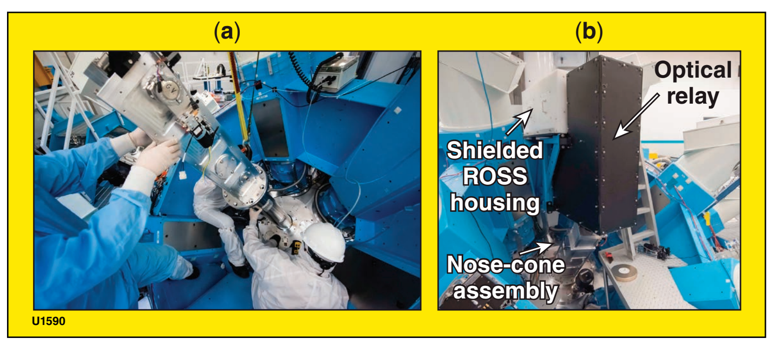

Figure 2. Image of the installation of (a) the NTD nose-cone assembly and (b) the full NTD assembly that consists of the nose-cone assembly, the optical relay assembly, and the shielded ROSS streak-camera housing.

Omega Facility Operations Summary: In June 2013, the Omega Laser Facility conducted 113 target shots with an average experimental effectiveness of 91.4%, including 59 shots on the OMEGA 60-beam laser with an effectiveness of 96.6% and 54 target shots on OMEGA EP with an effectiveness of 85.2%. In addition, the facility carried out 21 facility maintenance shots during the period. A total of 66 target shots were carried out for the ICF program by LLE and LLNL scientists. The HED program accounted for 29 shots by LLNL and LLE teams and an LLNL team carried a six-shot LBS campaign. CEA (France) had 12 target shots on the OMEGA laser. The Omega Laser Facility closed out the third quarter of FY13 with a total of 1,386 target shots and 54 maintenance shots and with an average overall experimental effectiveness of 96.5%.

1. P510PSU streak tube, Philips Photonics, Slatersville, RI 02876.

Contact: John M. Soures (585) 275-3866; fax: (585) 256-2586; e-mail: jsou@lle.rochester.edu