Polar-Drive Ignition Target Design: A high-gain triple-picket, polar-drive hot-spot-ignition target design for the National Ignition Facility has been developed. This design is based on the target[1] used on OMEGA to achieve an areal density of nearly 300 mg/cm^2 (Ref. 2). The design was optimized using the simplex optimizer *Telios*[3] in 1-D, and manually in 2-D, for both higher energy (~1.5 MJ) and polar-drive beam configuration (Fig. 1). The use of a triple-picket pulse (shown in Fig. 2) represents a qualitative change from the previous polar-drive hot-spot-ignition design. OMEGA experiments have demonstrated that picket pulses are better suited to experimental shock tuning.[4] Relaxation pickets, for which the laser power is small or zero between the pickets, allow for greater adiabat shaping and greater shell stability.[5] The use of a rapid-rise drive pulse improves the predictability of shock timing compared to a slow rising pulse. A "step" pulse at the start of the drive reduces the target adiabat. The final pulse specifications are within NIF single-beam energy and power thresholds. The design differs from the previous polar-drive hot-spot design in four ways: (1) a thick CH ablator is used to minimize the risk of hot-electron preheat; (2) a newly optimized set of multiple-frequency-modulator SSD parameters are employed,[6] improving on the multi-FM beam smoothing used previously; (3) a shim is used on the inner surface of the DT ice; reducing the mass being driven at the equator helps offset the reduced drive caused by greater angles of incidence for the equatorial beams; and (4) dynamic bandwidth reduction is used.[7] Multi-FM SSD is assumed to operate only during the pickets, and is off during the step and drive pulse. This reduces the danger of damage to the laser optics. The sensitivity of this design to variations in target and laser properties is underway. When expected target and drive nonuniformities are included, this design achieves a 2-D gain of 45.

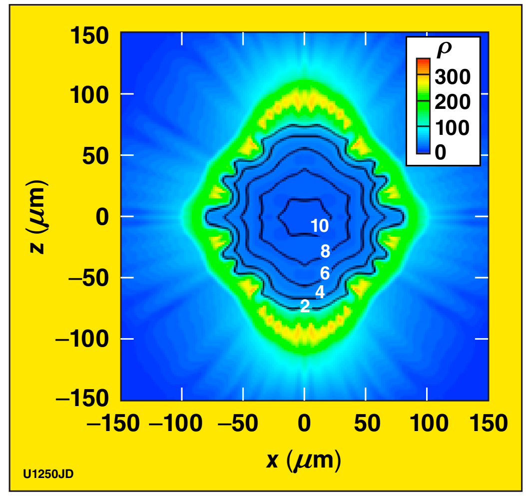

Figure 1. A 2-D *DRACO* simulation of the polar-drive point design at 10.3 ns around peak compression. Color contours indicate mass density, and ion temperature is indicated with white contour lines. This simulation modeled the northern hemisphere of the target and included expected levels of imprint, power imbalance, ice roughness, beam mispointing and mistiming, and surface roughness.

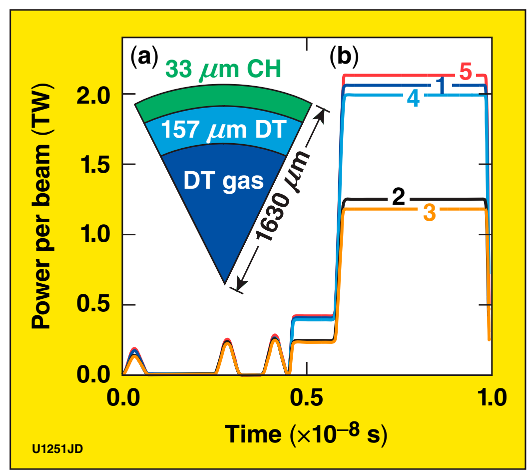

Figure 2. (a) Characteristics of polar-drive ignition target and (b) pulses for each of the five NIF rings of beams per hemisphere. Three pickets are used to set the fuel adiabat. A step pulse (starting at 4.5 ns) allows for a lower-power drive pulse (6 ns). The rapid rise for the step and drive pulses is used to facilitate shock timing.

Omega Operations Summary: The Omega Facility conducted 158 target shots in March (112 on OMEGA and 46 on OMEGA EP, respectively) with an average experimental effectiveness of 97.8% (98.2% for OMEGA and 96.7% for OMEGA EP, respectively). A total of 87 target shots were provided for NIC for teams led by scientists from LLE and LLNL. Three NLUF teams led by MIT, the University of Michigan, and the University of California, Berkeley, conducted 22 target shots; 19 shots were provided for LBS experiments conducted by LLE. Scientists from LLNL and LANL conducted 24 target shots for the HED program and 6 shots were provided for an experiment led by CEA scientists.

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