

LLE Review



Quarterly Report

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In Brief

This volume of the LLE Review, covering the period April–June 1999, features a theoretical analysis of direct-drive target performance on NIF. In this article R. P. J. Town, J. A. Delettrez, R. Epstein, V. N. Goncharov, R. L. McCrory, P. W. McKenty, R. W. Short, and S. Skupsky detail ignition target designs developed at LLE specifically to achieve successful direct-drive ignition on the NIF facility. A baseline “all-DT” target design is described along with a two shock compression analysis, which includes discussion of the parameters leading to variability in shock timing. The modeling and analysis presented flow down to specification requirements for the laser and target parameters to ignite this baseline target design with the NIF laser.

Additional highlights of the research presented in this issue are

- P.W. McKenty, M. D. Wittman, and V. N. Goncharov discuss the measurement of one of the critical parameters contributing to the performance of cryogenic DT targets: the uniformity of the inner ice surface. A numerical analysis is described that follows from a novel optical technique used to isolate the surface under investigation and resolve perturbations at the relevant level.
- B. Yaakobi, V. A. Smalyuk, J. A. Delettrez, and R. P. J. Town summarize the use of an embedded titanium layer in spherical targets to determine the areal density of the compressed shell. Target performance enhancement with the SSD beam-smoothing effect turned on is characterized with this method. A recently developed pinhole-array x-ray spectrometer captures core images below and above the *K*-edge energy of titanium. Results are compared with 2-D *ORCHID* simulations.
- S. P. Regan, J. Marozas, J. H. Kelly, T. R. Boehly, W. R. Donaldson, P. A. Jaanimagi, R. L. Keck, T. J. Kessler, D. D. Meyerhofer, W. Seka, S. Skupsky, and V. A. Smalyuk present techniques to characterize the laser-irradiation nonuniformity on OMEGA using time-integrated UV equivalent-target-plane imaging. A comparison of observed 2-D SSD beam-smoothing rates and theoretical predictions for the 0.2-THz SSD system currently on OMEGA permits confident extrapolation to larger-bandwidth smoothing effects.
- V. A. Smalyuk, T. R. Boehly, D. K. Bradley, V. N. Goncharov, J. A. Delettrez, J. P. Knauer, D. D. Meyerhofer, D. Oron, D. Shvarts, Y. Srebo, and R. P. J. Town discuss the growth and imprinting characteristics of planar targets in the presence of the three beam-smoothing effects available on OMEGA. Throughfoil radiography was used to observe the saturation of 3-D perturbations produced by laser imprinting; the results were compared to those predicted by the Haan model.

- F. Dahmani, A. W. Schmid, J. C. Lambropoulos, S. Papernov, and S. J. Burns, present experimental results on the changes in the thresholds for initiation of crack formation as well as propensity for crack growth in fused silica and BK7 glasses under applied stress. Biaxial applied stress is shown to raise damage thresholds by significant amounts for these optical materials common to fusion-class laser systems.
- J. L. Chaloupka and D. D. Meyerhofer discuss the trapping of high-energy electrons in a single-beam ponderomotive optical trap. Thomson-scattered light from the electron trap was enhanced through the use of a novel trapping focus of the laser. The scatter distribution is compared with simulations for ordinary and trapping-focus beams.

Samuel F. B. Morse
Editor