

---

## Contents

Executive Summary .....	v
Direct-Drive Cryogenic Target Implosion Performance on OMEGA .....	1
Hot-Core Characterization of a Cryogenic D <sub>2</sub> Target at Peak Neutron Production in a Direct-Drive Spherical Implosion .....	11
Extended X-Ray Absorption Fine Structure Measurements of Laser Shocks in Ti and V and Phase Transformation in Ti .....	16
Picosecond Response of Ultraviolet Photodiodes on GaN .....	25
Self-Assembly of Coated Colloidal Particles for Optical Applications .....	28
A Tunable, High-Repetition-Rate, Harmonically Mode-Locked, Ytterbium Fiber Laser .....	36
Deterministic Microgrinding, Lapping, and Polishing of Glass-Ceramics .....	40
Performance of 1-THz-Bandwidth, 2-D Smoothing by Spectral Dispersion and Polarization Smoothing of High-Power, Solid-State Laser Beams .....	49
Effect of Electric Fields on Electron Thermal Transport in Laser-Produced Plasmas .....	54
Effects of Nonuniform Illumination on Implosion Asymmetry in Direct-Drive Inertial Confinement Fusion .....	67
Convective Stimulated Brillouin Scattering (SBS) in One- and Two-Ion Plasmas .....	73
Imprint Efficiency Measurements in Laser-Driven Plastic Foils Using Beams with Different Angles of Incidence .....	90
Stopping of Directed Energetic Electrons in High-Temperature Hydrogenic Plasmas .....	97
Operation of a Single-Photon-Counting X-Ray CCD Camera Spectrometer in a Petawatt Environment .....	103
Theory of Laser-Induced Adiabatic Shaping in Inertial Fusion Implosions: The Relaxation Method ...	106
Using Nuclear Data and Monte Carlo Techniques to Study Areal Density and Mix in D <sub>2</sub> Implosions .....	122
Two-Dimensional Simulations of Plastic-Shell, Direct-Drive Implosions on OMEGA .....	139

Formation of Deuterium-Ice Layers in OMEGA Targets .....	160
KB-PJX: A TIM-Mountable Streaked Imager Based on a Versatile X-Ray Microscope Coupled to a High-Current Streak Tube .....	183
A High-Energy, High-Average-Power Laser Using Nd:YLF Rods Corrected by Magnetorheological Finishing .....	194
Prototypes of NIF Neutron Time-of-Flight Detectors Tested on OMEGA .....	202
Subpicosecond Faraday Effect in $Cd_{1-x}Mn_xTe$ and Its Application in Magneto-Optical Sampling .....	208
Simulation of Submicrometer Metal–Semiconductor–Metal Ultraviolet Photodiodes on Gallium Nitride .....	212
Overpressure Contact Printing and Its Applications in the Fabrication of Arrays of Magnetic Rings .....	218
Shock Propagation in Deuterium–Tritium–Saturated Foam .....	227
Demonstration of Real-Time, Phase-Locked Alignment of Tiled Gratings for Chirped-Pulse–Amplified Lasers .....	242
<i>In-Situ</i> Measurements of High-Intensity Laser Beams on OMEGA .....	252
Chemical Durability of Phosphate Laser Glasses Polished with Pitch, Pads, or MRF .....	257
Nanoscale Vibrational Analysis of Single-Walled Carbon Nanotubes .....	269
Polymer Cholesteric Liquid Crystal Flake Reorientation in an Alternating-Current Electric Field ....	274
LLE’s Summer High School Research Program .....	282
FY04 Laser Facility Report .....	284
National Laser Users’ Facility and External Users’ Programs .....	286
Publications and Conference Presentations .....	315