
NOVA/BEAMLET/NIF UPDATES

JULY–SEPTEMBER 1998

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Nova Operations

Nova Operations performed 256 experiments during this quarter, which was enough to exceed the goal of 900 experiments during FY98. These experiments supported efforts in ICF, Defense Sciences, university collaborations, Laser Science, and Nova facility maintenance.

While continuing to make minor improvements to the capabilities of Nova, we began the process of planning the decommissioning of the Nova facility during the upcoming fiscal year. Nova will be shut down to make room in Building 391 for National Ignition Facility (NIF) Project activities. Some of the laser components from Nova will be reused in the NIF facility; the remaining components will be made available for use at other facilities.

The operation of the Petawatt Laser Project was substantially improved with the installation of a set of mirrors that allows beamline 6 to bypass the 46-cm amplifiers without physically removing them from the space frame. This saves several hours during the process of converting that beamline to and from the Petawatt configuration, allowing Nova to use beamline 6 for Petawatt shots and ten-beam target shots during the same day. Also during this quarter, we initiated the installation of hardware required for a campaign of cryogenic ten-beam target shots, which are among the 585 experiments planned for next year.

Beamlet Operations

The fourth quarter of FY98 saw Beamlet complete its mission as laser physics and engineering test bed for the National Ignition Facility (NIF). The last Beamlet shot was fired on July 31, capping a highly productive four-year period of NIF laser technology and component development activities, including over 1000 full-system shots in over twenty experimental

campaigns since its activation milestone in September 1994. In the first month of this quarter, 46 shots were completed in two campaigns: (1) large-aperture damage testing of a polarizer and mirrors for the French Commissariat à l'Énergie Atomique (CEA) and (2) high-energy operation of a NIF-like final optics configuration at 3ω (the third harmonic). Shutdown activities commenced immediately thereafter.

The damage testing of the CEA polarizer was conducted with "p" polarized light at a beam size of 34 cm. The polarizer was conditioned off-line prior to the test. Minor damage sites a few hundred microns in size were observed after the first shot at an aperture-averaged fluence of 1.9 J/cm^2 in a 9-ns square pulse. This was the only damage observed, however, and it did not grow on subsequent shots at fluences up to 11.9 J/cm^2 . Two CEA mirrors were also damage tested. One of the mirrors was unconditioned and the other had two levels of conditioning applied in different regions of the aperture. Both mirrors were exposed to aperture-averaged fluences of 20 to 30 J/cm^2 in 3-ns square pulses, which was achieved by positioning the mirrors 3.5 m downstream of the Beamlet final focus lens at a beam size of 17.8 cm. The only damage occurred midway through the testing of the first mirror and was caused by contamination.

The high-energy tests of NIF prototype final optics achieved third-harmonic fluences of up to 8 J/cm^2 and NIF-equivalent energies of up to 9.6 kJ in 3-ns square pulses. The purpose of the test was twofold: (1) to validate the design of the NIF final optics cell (FOC) at high fluence and (2) to operate an integrated NIF-like final optics package, including diffractive optics, to obtain data for estimating component lifetimes on the NIF. Tests of the FOC alone confirmed that it can be operated at full fluence without the large-area damage previously observed and attributed to a mismanaged back reflection. Isolated damage was observed, however. Results of the integrated tests revealed problems

with color-separation-grating (CSG)-induced beam modulation and damage associated with the sol-gel coating being nonconformal with the grating—an effect previously identified as being responsible for reducing CSG diffraction efficiency. Improved CSG designs under development are expected to eliminate this problem.

Disassembly of the Beamlet Facility began on August 3. Approximately two-thirds of the laser was designated to be shipped to Sandia National Laboratories (SNL), New Mexico, for use as a back-lighter on the “Z pinch” facility. The remaining one-third was packaged and turned over to various groups of the NIF Project. The disassembly was completed by October 1, and the facility was turned over to Lawrence Livermore National Laboratory’s (LLNL) Plant Engineering Directorate for transition to the NIF Frame Amplifier Unit Assembly Area. Over 350 crates were shipped to SNL, varying in size from 2 ft square to the largest crate containing the front-end frame which was 7 ft tall, 8 ft wide and 51 ft long and weighed ~18,000 lbs. The large amplifiers are still on site, in storage, awaiting clean disassembly and eventual transfer to SNL.

National Ignition Facility

Overall Assessment

Overall progress on the NIF Project remains satisfactory for the fourth quarter of FY98. The current top-level assessment of Project status remains similar to that stated at the end of the third quarter 1998; that there will be no change to the fourth quarter 2001 Level 2 milestone for the End of Conventional Construction, nor to the fourth quarter 2003 Project Completion date. However, the NIF Project Office now anticipates that based upon the status of Conventional Facilities, CSP-4, work on the Laser Bay Core and the status of Special Equipment design and procurement, there could be an impact of 6 to 8 weeks in the fourth quarter 2001 completion of the Level 4 milestone for start-up of the First NIF Bundle. The impact of current field conditions on this important milestone, which is to be completed in three years, continues to be evaluated on a weekly basis at the Project Top Ten Scheduling meeting.

For NIF Conventional Facilities, fourth quarter 1998 was a period of relatively high productivity. Work completed in the field progressed from 17.5% at the end of June to over 28% by the end of September. Efforts on the site rapidly accelerated as the average manpower on site increased to over 180 and will approach 300 by the end of the first quarter 1999. The structural steel erection, bolting, and plumbing has been completed for the Laser Bays and Core sections, and roofing and siding is in process, but the progress

on critical interfaces to CSP-9 is approximately eight weeks behind schedule. Efforts to accelerate the Laser Bay steelwork during the fourth quarter 1998 did not materialize due to labor difficulties with the ironworkers, but the Laser and Capacitor Bay areas will be sufficiently “dried-in” prior to the start of the rainy season. The concrete walls have been poured to about ground level in the Target Area and Switchyards, and installation of the Target Chamber on its pedestal is on schedule for March of 1999. The Optics Assembly Building (OAB) structural steelwork is complete and is generally on schedule.

In Special Equipment, at the end of the fourth quarter the Mid-Title II (65%) Design Reviews were 93% complete, and final Title II (100%) Design Reviews were 60% complete. There were four Special Equipment Title II (100%) Design Reviews planned for FY98 that remain to be completed in the first quarter 1999. Design closure and drawing production were slower than planned, but critical path designs were generally on schedule. Major awards have been made for the spatial filter vacuum vessels and vacuum beam tubes, the Laser Bay structures, and for the Switchyard 2 structural steel tubing.

In Optics, facilitization was in final stages at most vendors as they started or prepared to start pilot in early FY99. All laser glass contracts were either in place or will be placed at the beginning of the new fiscal year. Nd was in hand at both Schott Glass Technologies and Hoya Optics for their pilots. Potassium dihydrogen phosphate (KDP) rapid-growth facilitization at Cleveland Crystals, Inc. (CCI) and Inrad has gone well, and they have made excellent progress growing their first crystals, up to 27 cm in size. Corning was nearing completion of facilitization. The accelerated fused silica pilot was awarded early in September and has begun. Tinsley continued to make excellent progress on their finishing facility, and they demonstrated outstanding performance with the first four lenses, which will be used on the NIF first bundle. Zygo was making good progress with their facility, including resolution of the pitch problem discussed in previous reports and initial hiring for pilot production. The University of Rochester Laboratory for Laser Energetics (UR-LLE) and Spectra-Physics continued to make good progress preparing for their pilots.

Key Assurance activities during the fourth quarter were all on schedule, including construction safety support, litigation support to the Department of Energy (DOE) for the settlement of 60(b) (e.g., quarterly reports), and the *Final Safety Analysis Report*. The *Pollution Prevention and Waste Minimization Plan* was completed in August, one month ahead of schedule, achieving a Level 2 DOE milestone.

There were 39 DOE/OAK Performance Measurement Milestones due in the fourth quarter,

and 33 were accomplished. There were a total of 95 milestones due through the end of FY98, and 85 have been accomplished.

Site and Conventional Facilities

The fourth quarter of FY 1998 was a period of high productivity for NIF Conventional Facilities. Work completed in the field progressed from 17.5% at the end of June to over 28% by the end of September. Efforts on the site are rapidly accelerating as the average manpower on site has increased to over 180 and will approach 300 by the end of the first quarter 1999.

Bolting the core steel was the main focus on the Laser Building so that as much of the deck as possible could be released to CSP-9 to allow for rough-in and concrete placement to start in September. Bolting and plumbing of Laser Bay 1 lagged due to the lack of ironworkers, but by the end of September, the entire crew completed work on the core and started work on Laser Bay 1, which should be completed during the month of October.

Roofing operations started in September and made significant progress. In the three-week time frame that the roofing subcontractor worked, the entire Laser Bay 2 roof was dried-in along with nearly half of the Laser Building core area. The roofing subcontractor accelerated its schedule to complete all the roofing on the Laser and Target Area Building (LTAB) in an eight-week time frame.

A primary focus of work for October will be to continue to "dry-in" the building and to protect the site to the fullest extent possible from the upcoming winter weather. The site storm drainage system has been completed and is ready to receive runoff from the Laser Building and OAB roof drains. The Target Building will not have the roof constructed and will be open to weather this coming winter. Regrading and surface treatment of the site to allow for proper drainage will occur in October to permit access and laydown through the coming winter. *Storm Water Pollution Prevention Plan* requirements are scheduled to be completed during October. The *NIF Site Winterization Plan* will be reviewed by wet weather specialists, EarthTech, and finalization of the plan will occur in October.

- FY98 DOE/OAK Performance Measurement Milestones completed this quarter included: "OAB Start Structural Steel Erection," achieved in June; "Laser Bays: Complete Structural Steel Erection," completed in August; and "Power Available," completed in August.
- Nielsen Dillingham (NDBI) completed erection of structural steel for the OAB Corridor and is substantially complete with all steel erection for CSP-4 Phase I.

- Activities increased in the OAB in September as more trades manned the site. Midstate Steel nearly completed their work, including the roof truss punch list. Magnum Drywall mobilization occurred in September; they installed studs around the perimeter of the building and, by the end of the quarter, were ready to start sheathing installation (see Figure 1).
- Work by CSP-6/10 continued in all four areas of the Target Building. The target pedestals have been constructed up to the ring at elevation -8'-9" (see Figure 2). The radius wall up to elevation -3'-6" is formed on one side with rebar, and embed/blockout installations are nearing completion. The radius wall pour from elevation -21'-9" to -3'-6" is taking longer than expected, but the complexity and need for precision of the blockouts and embeds is very critical. This pour and the similar one higher up on the radius wall from elevation 48'-0" to 68'-3" are the most difficult pours on the project; therefore, the extra time required to assure they are correct is justified. Despite the extra time used, the milestone for installation of the Target Chamber has not slipped. The first lift for Switchyards 2 and 1 walls up to elevation 3'-6" have been completed on all three sides. Forms for walls in Switchyard 2 are being jumped for the next lift in October. The south wall of the Diagnostics Building basement was placed in September. Currently, CSP-6/10's schedule meets the critical milestone dates for installation of the Target Chamber and Switchyard structures.
- The bulk of the Site Utilities scheduled for this year were completed in the fourth quarter by



FIGURE 1. Installation of metal studs in the OAB.
(40-60-0998-1855#11)

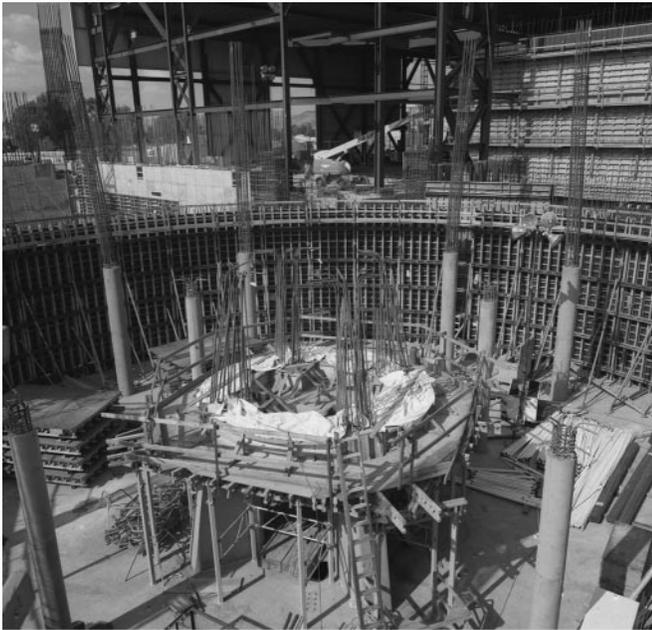


FIGURE 2. Shoring and forming for the target bay pedestal.
(40-60-0998-1942#08)

Hensel Phelps (HPCC). The Site Utilities are continuing (but are winding down): including installation of temporary/permanent duct-banks around the OAB, south side of the site, and sectionalizing switches and vaults north of CB4. Complete installation of the storm drain system will occur in October. In addition, HPCC completed erection of Central Plant structural steel as well as completed forms, reinforcing, and placement of Cooling Tower walls. The placement of concrete on the metal deck was completed for parts of Core Areas "A" and "B" elevations 28' and 47'-6". Within LB2 and CB4, HPCC began installation of underslab precast duct in LB2 and began installation of underslab conduit in CB4. The installation of LB2 overhead platform up to Column Line 24 was completed and HPCC began installation of mechanical, fire sprinkler, and electrical rough-in off of the platform. Work by CSP-9 in the core area was under way at both mezzanine levels. CSP-9 overhead rough-in work in Laser Bay 2 (utilizing the overhead platform) was off to a good start and progress appeared to be at or above the originally scheduled pace.

Special Equipment

Design Reviews continued to be successfully held at both the Mid-Title II (65%) and final Title II (100%) design levels. Design closure and drawing production were slower than planned, but critical path designs

were on schedule. Awards were made for the Laser Bay structures.

During the fourth quarter, many of the Special Equipment Title II Engineering activities were brought to an end. Title II 65% Design Reviews were held for the OSECS Safety Interlock and Video Surveillance System and for the Transport and Handling System. The final (100%) Design Reviews were held in July and August for the Alignment System, Pockels Cell, the Mechanical Utilities, the Optical Design, the Gas Handling System, the Laser Auxiliary System, and the Safety System. Ten final (100%) Design Reviews were conducted in September, including Final Optics Damage Inspection/Pulse Synchronization, Output Sensor/Relay Optics, Optical Mounts, Target Positioner, Target Area Structures, Main Laser Alignment, Optical Pulse Generation, Power and Back Reflection Sensor/ 3ω Energy/Portable Sensor/Energy Diagnostics/Power Diagnostics, Target Chamber Vacuum, and Laser Amplifier. Final Documentation Reviews were held for the Switchyard 2 Support Structures Procurement Documents, the Switchyard Tube Enclosures Design and Procurement, and for the Laser Bay Support Structures Concrete Pedestals.

Laser Systems. The optical pulse generation (OPG), plasma electrode Pockels cell (PEPC), and amplifier subsystems each held well-received 100% Title II Design Reviews during the fourth quarter. The fabrication drawings are now complete, or nearly so, in each of these areas. The emphasis is now shifting to procuring and assembling hardware for the first bundle. In the Power Conditioning area, assembly of the First Article module essentially realized the baseline capacitor bank design for the NIF. Over 1000 shots were accumulated at full NIF current levels.

- The OPG 100% Title II Design Review was completed in September. This milestone represented a shift in the team's focus from design to procurement and fabrication. The current plan calls for an integrated test of the OPG hardware in Building 381 prior to reinstallation in the LTAB. A major focus of the OPG team during the past quarter has been identifying and testing a distributed feedback (DFB) oscillator connected to a high-gain fiber amplifier to provide the required input pulse to the master oscillator fiber distribution system. DFB oscillators from two vendors were evaluated and both demonstrated excellent single-mode operation. The requisite power and noise levels were achieved using a high-gain, double-pass fiber amplifier. Testing of the Stimulated Brillouin Scattering (SBS) fail-safe circuit (intended to prevent propagation of a pulse with inadequate bandwidth to prevent SBS) began during the last quarter and produced encouraging results. A new circuit approach in

the arbitrary waveform generator was tested and was shown to reduce the electrical noise to a level consistent with meeting the stability requirement during the "foot" of the Haan pulse shape. This change allows the vendor to proceed with the final design of the pulse shape generator for the NIF. The prototype preamplifier module demonstrated all of its key performance requirements including energy and phase error during this quarter, adding substantial credibility to the design.

- The 100% Title II Review of the Amplifier was held as scheduled in September. The 13-volume Amplifier design basis book was prepared, reviewed, and submitted to the NIF document center. Approximately 95% of the drawings of the Amplifier components were submitted to the NIF Project Database Management system, and approximately 30% of the assembly, interface, and assembly equipment drawings were completed. All interface control documents were completed and are under configuration control, though some will be modified as the interfacing system designs evolve. Approximately 75% of the supporting calculations were completed, and many but not all of the design implementation plans were prepared. The failure modes and effects analysis and reliability, availability, and maintainability analyses were updated for Title II. A 700-shot cleanliness test was completed using the AMPLAB amplifier. The results indicated that damage growth on a slab in the amplifier is consistent with achieving the recently modified operational contamination damage levels proposed by the Project Scientist (beam obscuration <1% and no damage site larger than 1 mm). This result indicates that NIF contaminant levels can be achieved at installation and that in operation, the slab damage levels are within acceptable replacement limits.
- The PEPC subsystem also completed a very successful 100% Title II review during the fourth quarter. There were very few action items generated by the reviewers, and responses have been completed for all of them. All of the mechanical drawings for the PEPC subsystem are complete, and the procurement process is under way at an aggressive pace to attempt to benefit from a slack period for machine shops that traditionally support Silicon Valley companies. During the past quarter, the emphasis was on demonstrating acceptable switching performance over a 100-ns time window to enable appropriate timing of target backlighter beams. The requirement was met after minor modifications to the switch pulse termination resistors to sharpen the rise and fall

times of the pulse, effectively broadening the "in spec" portion of the pulse. Control system software testing has begun in the prototype laboratory to demonstrate proper controls operation and robustness for operation in the Pockels cell electromagnetic interference environment.

- The NIF First Article capacitor module was assembled during the fourth quarter. Roughly 1000 full-current shots were completed, and the lifetime of the switch under NIF-like operating conditions is consistent with predictions. Late delivery of the flashlamp load, coils, and cables consistent with the baseline design resulted in the use of the old prototype parts for these initial tests. Therefore, the waveshape and charge voltage are not yet representative of the NIF. Module operation consistent with the amplifier requirements is planned for the first quarter of FY99. An environmental, safety, and health (ES&H) review of the module design and operation concluded that the gaseous effluent from the switch contains sufficient ozone and nitrogen compound levels that an outside exhaust vent is needed. The noise level and other safety-related controls were found to be acceptable.

Beam Transport System. In this quarter, major fabrication contracts were awarded, mill order material was shipped, and production of Laser Bay structures and vessels was ramped up after completion of shop drawings and quality assurance submittals. Shop operations during this period included welding fixture fabrication, plate cutting, and structural member preparation. These 11 contracts are currently on schedule to meet the installation milestones.

The Beam Transport System acquired government excess material-handling equipment for upcoming installation activities, including an Oshkosh diesel prime mover, a 45-ton Taylor forklift, and a 60-ton capacity battle tank trailer. These assets are now at LLNL for the cost of shipment and are fully operational.

Laser Bay concrete structure and Switchyard 2 structure design drawings were released for construction change order quotations from the existing Conventional Facilities contractors. The mill order for Switchyard 2 tube steel was awarded in August. Auxiliary Subsystems completed the Title II Design Reviews for the Gas Handling System, Amplifier Cooling System, and Conventional Utilities. All amplifier cooling fan units have been received and are currently stored in the laydown area awaiting installation into the LTAB. Other activities include the following:

- Production of the stainless steel plate neared completion. Vacuum vessel fabrication activities are proceeding with the three selected contractors. Two contractors completed preliminary

documentation, and their fabrication activities are proceeding on schedule. Fabrication plans and procedures are being reviewed and revised with the third contractor to ensure compliance with the specifications and drawings.

- The drawing packages for the Switchyard 2 beam tube enclosures are complete, and the procurement requisition is prepared and submitted for request for proposals (RFP) release. The specification for the Switchyard and Interstage Beam Enclosures was updated and revised, incorporating design review comments and other recommended changes learned during ongoing fabrications for the vessels and beam tubes.
- The Airlock/Sliding Door feature of the Roving Enclosure was removed to reduce costs. Roving Enclosure design will continue to include features that can accommodate future installation and conversion on a “Not to Preclude” basis.
- Design detailing is proceeding on the interstage docking frames at the Spatial Filter (SF) end vessels. Engineering review and design checking remain to be performed. Design development and detailing is behind schedule on the large interstage components at the switchyard wall. These structures must be fabricated and installed into the Laser Building before closure of the facility holdouts.
- The Title II 100% Design Reviews for the Amplifier Cooling System, the BTS Auxiliary Subsystems, Gas Handling system, and the Mechanical Utilities, which included Fire Protection as well as Lighting and Power subsystems, were completed.
- The mill order for Switchyard 2 tube steel was awarded in August. The Title II 100% procurement review was held in preparation for the change order proposal solicitation from the CSP-6/10 contractor.
- The Cavity Spatial Filter Optical Bench, Transport Spatial Filter Optical Bench, Injection Structure, and Preamplifier Support Structure Safety Notes were completed. Contracts were awarded for the Main and Power Amplifiers, Laser Mirror 1 structures, Cavity and Transport Spatial Filter optics benches, Injection Structures, Preamplifier Support Structures, and Periscope structures.

The Optical Mounts Title II 100% Review was held in September. Final designs were presented for spatial filter lens cassettes, the injection system, cavity mirror/polarizer mounts, shutter/beamdump, Switchyard transport mirrors, and Target Area transport mirrors.

- A full-size rectangular test mirror with “holes” drilled in the back was mounted and evaluated

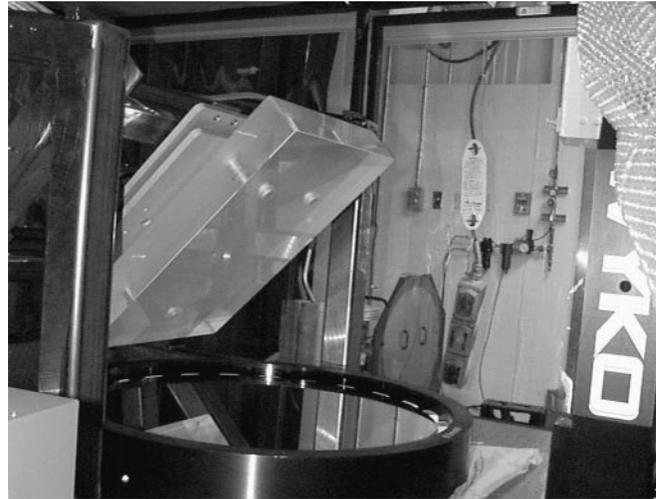


FIGURE 3. Transport Mirror Mount testing at use angle. (40-00-0199-0193pb01)

interferometrically (the mirror was tested vertically and in the down-facing orientation shown in Figure 3). This test is part of the validation plan for the transport mirror attachment concept and mount design. The preliminary results indicate that the observed distortion is less than predicted from finite-element analysis. The results to date indicate that the so-called “expanding mandrel” design will hold the mirror sufficiently well.

Integrated Computer Control System. Title II design progress is satisfactory. Seven out of a total of eight scheduled 100% reviews have been completed. Two reviews were completed during the fourth quarter: the Integrated Safety System and the Automatic Alignment System.

- At the end of September, the controls team accomplished the last of the FY98 Cost Account Plan milestones. These milestones, scheduled some fourteen months ago, were transformed into a much larger software delivery: the first integrated production prototype (code named Nightlight), consisting of incremental deliveries of 8 supervisory and 15 (out of 18) front-end processors (FEPs) (see Figure 4).

This prototype (the first of seven planned) had several major goals:

- Risk mitigation by early execution of important functions.
- Testing frameworks in actual use within applications.
- Gaining experience and confidence with software tools and engineering processes.



FIGURE 4. Nightlight software demonstration at the test bed operator console. (40-00-0199-0194pb01)

- Activating the independent software testing capability.

The theme of this first prototype was the vertical slice: the execution of initial functionality in each subsystem using either emulated or prototype hardware. Most slices included both supervisory and FEP functions; a few were limited to FEPs only. Almost all slices made use of the reusable frameworks upon which all controls software will eventually be built. Those that did not concentrated upon important application-specific behavior. In addition, significant new work was done on frameworks prototyped or designed earlier in the Project. Among these were the message logger, the sequence control language, the graphical user interface, the sample (or generic) application, and the shot life cycle.

To date, the vertical slices for target diagnostics, laser diagnostics, PEPC, integrated timing system, special imaging sensors, graphical user interface, and the sample application have been demonstrated—the first of three steps that certify completion of the software delivery: (1) demonstration to a project management team member, (2) placing the software under configuration control, and (3) independent testing of the software.

Due to the complexity and importance of the shot director and power-conditioning slice, its delivery has been delayed to the end of October. Because effort was redirected toward the graphical user interface portion of the sample application, the industrial controls vertical slice was also delayed to the end of October. The remaining slices are expected to be demonstrated in early October.

A major goal of Nightlight was validation of the distributed software architecture and the implementation process. While not every goal was achieved in this

release, the important risks were successfully addressed and confidence was gained that the software needed to control the first bundle can be incrementally completed by repeating this process.

- The example supervisor software that will serve as a pattern for all eight NIF subsystems was constructed and tested. This demonstrates how the supervisory architecture is to be deployed and how each program is connected to the database, framework services for configuration, system manager, monitor, message logging, and graphical user interfaces. The new generic supervisor is analogous to the generic FEP that has been in use for several months. The new component adds a number of features needed by supervisor-level code: public and private internal objects for upper-level controls, communication with one or more graphical user interfaces, and bidirectional connections between distributed objects.
- Berkeley Nucleonics presented a satisfactory design review for the prototype Integrated Timing System delay generator in September. About 200 units are needed for the NIF. They have selected an acceptable optical receiver and are progressing on the basis that it will meet requirements, while also testing a discrete design intended to reduce propagation delay as a function of optical power level.

The version of the timing FEP for Nightlight is complete and delivered to the software test team. It consists of a computer crate containing actual NIF hardware, except that a similar 4-channel delay generator was substituted for the custom 8-channel NIF delay generator currently under development. The Nightlight FEP provides a complete vertical slice of the architecture using the supervisory frameworks (system manager, configuration server, generic FEP, and graphical user interface) to create devices for trigger channels, trigger diagnostics, and precise trigger diagnostics. The software provides the ability to set delays, enable/disable channels, create epochs and activate triggers as well as measure and read the resultant delay using two types of time interval meters. The release demonstrates integration under both Solaris and VxWorks operating systems.

- The 100% Design Review of the Integrated Safety System was conducted in July, and the Automatic Alignment 100% Design Review was presented in August. System operations for optics inspection were analyzed and documented in the *Preliminary System Analysis for the Damage Inspection Control System*. In summary, the inspection of vacuum-loaded optics in the

spatial filters and final optics assembly (FOA) will require slightly more than two hours. Amplifier cooling time and the brief target chamber center keep-out period extend the maintenance access time to as long as three hours following the shot. Inspection time is dominated by mechanical actions times. For example, repositioning the roving mirror assembly accounts for 24% of this time.

- Integration activities have concentrated on the project-wide tasks required to develop and test Nightlight. Preliminary planning also began on deployment of integrated software for the second production prototype ("Penlight") that will feature software operation and testing in the Preamplifier Module and input sensor prototype labs.

Optomechanical Systems Management. Title II 100% Design Reviews were held for Optical Design and Optical Mounts. Detail drawing checking and final approval is lagging in Optical Mounts (spatial filter lens cassettes have been completed; others are in creation or checking). The Title II Design Review for Final Optics was delayed about one month to allow for additional scientific evaluations of the final Beamlet campaign results. About 60% of the detail drawings for Final Optics are approved or in checking.

Optical Design. Design and analysis activity has been focused on completing the detailed optical design, manufacturing tolerances, and specifications for small optics subsystems (e.g., output sensor relays and preamplifier beam transport).

- The Optical Design Title II 100% Review was held in July. The presentation included the review for compliance, Main Laser system optical design, Switchyard/Target Area mirror system optical design, final optics optical design status, large-aperture optics specification and drawings, and stray light control.
- Some follow-up ghost analysis was conducted for the Main Laser, diagnostic system, and the final optics. In the Main Laser model, mechanical elements (e.g., beam tubes) were added so that the analysis of stray light paths could be completed. A worst-case target back reflection was modeled in the FOA to determine ghost fluences in the 3 ω calorimeter chamber. A simplified model of the 1 ω diagnostic system was constructed; a second-order ghost analysis provided useful feedback for the final optical design.
- The optical model for the FOA was completed; the configuration will be described in an upcoming revision of the configuration drawing. Final revisions included detailed ray tracing of the 1 ω

diagnostic reflection from the focus lens and transfer of optical design data to Pro-E.

- The "Small Optics Summit" was held in September. Representatives from 66 optics and optomechanics manufacturers attended this very successful one-day event. The morning session comprised presentations from the responsible engineers who will deliver line replaceable units (LRUs) containing small optics (≤ 150 mm diameter) to the NIF. In the afternoon, the vendors set up displays in a tent, allowing NIF Project and other LLNL personnel to come by and ask questions about the capabilities of each supplier of interest to them.

Optical Components. All NIF optics Title II Design Reviews were held in September except the KDP Crystals. The reviews focused on progress to date of facilitation at vendor sites and at LLNL and validated readiness to proceed with Title III and with pilot production.

The contract for 13.5 metric tonnes of Nd salts was negotiated and is ready to place early in October with FY99 funding. This will support the first production runs of laser glass for Hoya and Schott. The NIF Amplifiers (slabs), NIF Lenses, NIF Mirrors, NIF Polarizers, and NIF Windows 100% Title II Design Reviews were completed in early September. The NIF QA/Metrology and NIF Processing Title II Design Reviews were completed in early September as well.

Laser Control. Four Title II 100% Design Reviews were presented in August. Taken together, they covered Main Laser alignment, the output sensor package, the beamline to output sensor relay optics, final optics damage inspection, pulse synchronization, power sensors, the 3 ω energy module, portable streak camera, back-reflection sensor, FEPs for energy diagnostics, power diagnostics, and special charge-coupled device sensors.

- The last of the input sensor drawings, namely the sensor assembly drawing and the test stand base plate and rails are now expected to be completed in October.
- Updated cost estimates for the beamline centering references were found to be higher than the plan, and efforts were made to simplify their implementation. A significantly less expensive approach to the centering reference on the FOA was identified.
- Optical design was begun for the spatial filter tower test stand that will be used for assembly and test in the OAB.
- Assembly of the Target Alignment Sensor hardware began. If performance meets expectations, this unit will be designated for use in the initial operation of the NIF.

- The number of FEPs was reduced in the plan from 108 to 100 to implement a decision removing motors from those mirror mounts in the Switchyard and Target Bay that are not part of the closed-loop control system.
- The optical alignment section of the acceptance test plan has been verified on the prototype. Other parts of the test plan, including motion tests of the motorized components, will be checked for suitability when the motor control electronics are added to the test stand.
- Efforts began to establish test capability for accurately measuring the reflectivity of 1ω sol-gel coatings in the 0.1% range. A preliminary capability was demonstrated using recent sample sol-gel samples.
- End-to-end tests of the power measurement instrumentation were completed in August. The results, which included a demonstrated precision of 1.5%, were documented during September and satisfy the appropriate part of the NIF power balance error budget.
- Disassembly of the precision diagnostics prototype systems in Beamlet was completed, and components were readied for storage.
- Tests on the LLNL deformable mirror prototype went very smoothly. The mirror clearly met the range specifications and showed a preliminary residual error of about 0.04 waves (rms surface) compared to the specification of 0.025 waves. The LLNL mirror is currently the only one of the three prototypes whose performance compares reasonably with NIF requirements; it will appear as the baseline for this review.

The adaptive optic was identified as a high-risk system component to be reviewed by the Project Risk Management Group. This group will review test data, modeling results, and other aspects of deformable mirror status as a basis for recommending a plan to complete development activities.

Target Experimental Systems. All 18 sphere plates have had their weld joint configurations machined on the edges and the inside surfaces smoothed (grinding marks removed) and have been shipped to LLNL. The last three are en route. The first three plates were installed on a welding fixture inside the temporary enclosure and welded to form a subassembly. PCC moved from the machining of the sphere plates to the fabrication of the weld necks. All of the cylindrical pieces are completed and the flanges are now being welded to them.

- The 60-foot-diameter, 62-foot-high, cylindrical enclosure, built on the E7 parking lot, which is to be used for the construction of the target chamber, was completed. It is now being used for the welding of the first three sphere plates that form the bottom of the chamber. Yet to be installed is the HVAC for the building, planned for October.
- The chamber gunite shielding (hereafter known as shotcrete) design was reviewed by LLNL. An alternative design was proposed and analyzed by Project personnel. The result was a system that would provide shielding but not become a structural member (composite) with the target chamber. This simplified design was discussed with two potential shotcrete installers who felt it was a very workable installation. The system consists of wire mesh attached to the chamber with studs on a 1.3-foot spacing. Additional limited rebar will be used around the weld necks, which will be isolated from the shotcrete by a barrier. This concept greatly reduced the amount of engineering and installation time for the shielding.
- The prototype stainless steel beam dump was removed from the Nova chamber at the end of July, and another fused silica optic was placed in the chamber after the prototype was removed to use as a baseline in the optic damage tests. The stainless steel beam dump showed no signs of catastrophic damage, and there was no evidence of excessive amounts of elements of stainless steel in the chamber.
- The target chamber vacuum 100% Title II Design Review was held in September. The first revision of the equipment specifications for the target chamber cryogenic high-vacuum pumps, gate valves, tritium gas-roughing pump, and turbodrag high-vacuum pumps was completed.
- The target positioner 100 % Title II Design Review was held in September.
- A web page has been developed to share diagnostic design information with representatives from LLNL, SNL, LLE, Los Alamos National Laboratory, and Atomic Weapons Research Establishment (AWE), U.K. The web page is internally accessible to LLNL experimenters and will soon be password accessible to NIF diagnostic users at other DOE sites. Discussions are taking place with a working group of people from other test facilities and labs to establish standards for diagnostics and their associated control and support equipment so that diagnostic can be used at multiple test facilities.

Software Requirements Specifications (SRS) and Software Design Descriptions (SDD) documents for Embedded Controller Software and FEP Software have been started. These will form the foundation of the Target Diagnostics FEP and controller SRS and SDD documents.

- The Diagnostic Instrument Manipulator (DIM) drive system is now being manufactured. The trolley is finished and has been fitted onto the bench. The electronic rack has been finished and is awaiting checkout. The DIM extension tube was being fabricated in the United States. The extension tube will be completed by the end of September and shipped to AWE early in October.
- In September, the 100% Title II Design Review was conducted for the engineering of the major mirror frame structural components. This included the target chamber pedestal, the mirror frame supports and enclosures, the seismic restraints, and the FOAs.
- The peer review team met with the NIF team in August and reviewed the revised calculations for the seismic loads applied to the top of the pedestal and the target chamber to floor. They agreed with calculations presented and supported the use of a steel encasement around the upper ring beam to increase the load-bearing capacity and increase the safety factor. The steel encasement was fabricated and delivered and is awaiting incorporation into the pedestal.



FIGURE 5. IOM 2-dof fixture with IOM in fully retracted position. (40-00-0199-0195pb01)

- The Tritium Environmental Protection Systems work has been delayed until 2004 to be able to prepare for the introduction of tritium into the facility in 2005. The exception to this delay is the stack monitoring system, which will be in place for first bundle.
- The prototype 2 degree-of-freedom Integrated Optics Module (IOM) handling fixture (see Figure 5) was successfully tested on the FOA test stand in Building 432. The fixture was tested at angular orientations of 130° , 135.5° , 150° , and 156.5° , which represent the positions of IOM units on the lower half of the target chamber. These initial tests have validated the basic concept. All drive mechanisms, alignment features, and installation procedures worked as planned. Deflection of the IOM translation arm was within tolerance with no interference with adjacent IOM units. All tests were conducted with a 125% test load of 1050 pounds.
- The FOA 100% Title II Review presentation was delayed by approximately one month until November to allow more time for scientific review of the last Beamlet tests using the final optics cell (FOC). The Project Scientist has been leading the scientific review of the data and establishing priorities for future work. The last series of shots (high-damage-threshold campaign) tested frequency conversion crystals, focus lens, and diffractive optics plates in a configuration similar to the NIF optical design. (There are some differences between the optomechanical configuration in Beamlet and the baseline NIF configuration.) Optical damage was expected and was observed; however, it is taking some time to reduce the data, understand the mechanisms, and determine the contributing factors.
- The frequency conversion technical management plan has succeeded in establishing a firm understanding of frequency conversion performance for the NIF final optics design (i.e., significant factors, status of technology, error budget). Requirements from a detailed error budget have been flowed down to metrology equipment, crystal fabrication, coating performance, and mount tolerances. There is very good correlation between analysis predictions and experiment.
- The ghost analysis of the IOM was completed during the quarter. The baseline absorbing material is a PTFE (Teflon) product with a trade name of Spectralon. This material selection is based on adequate damage threshold, fabrication/installation ease, and cost. Extensive ghost mitigation measures have been incorporated into the FOC final design. Additional measures can be implemented if

future tests and First-Bundle operation indicate that they are needed.

- Integrated testing of the fully assembled FOA prototype hardware began in the high bay of Building 432. The vacuum/venting sequence evaluations will confirm (or suggest modifications to) the final design details of the debris shield module, pumping rates, and so on.
- A modification to the FOA debris shield cassette frame is shown under test in Figures 6 and 7. (The tests are conducted in a clean, enclosed hood with particle measurement wafers beneath the hardware.) Particulate generation has almost

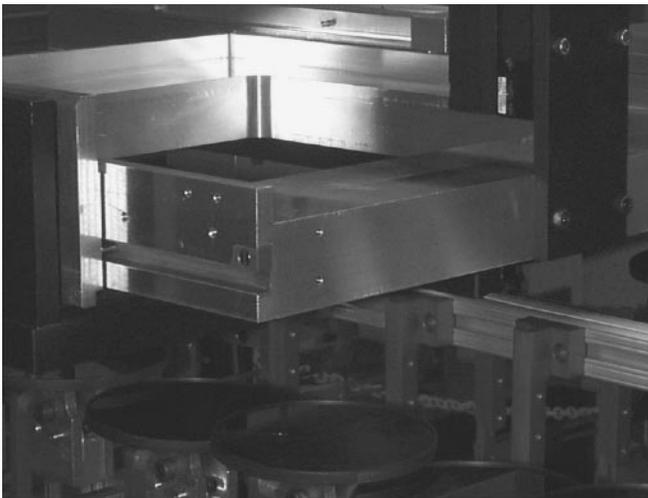


FIGURE 6. Debris shield cassette frame. (40-00-0199-0196pb01)

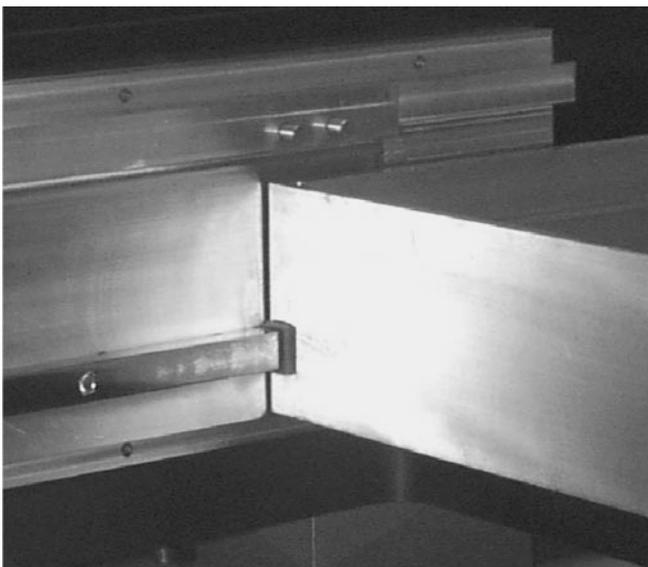


FIGURE 7. Cassette frame guide bar. (40-00-0199-0197pb01)

been completely eliminated with this design, which uses a solid stainless steel guide bar.

Operations Special Equipment

This has been a successful quarter with good progress in detailed design and prototype testing. Several DOE milestones were completed, including large procurements and design reviews. Preparations are currently under way for hardware installation in the OAB scheduled for October 1998.

- A number of significant changes for the OAB were agreed to in August during an LRU storage review. The IOM assembly area, Cave, and shutter assembly have been moved to Building 391. Space available in the OAB resulting from the location changes will be used for storage of LRUs. A complete 3D model of the animation sequence is being developed for formal review. This 3D integrated model will show extensive stay-out zones and will hopefully prevent major interference and space conflicts for the OAB, the corridor, and the LTAB aisles.
- The Transport and Material Handling 65% Design Review was successfully completed in August. Also an installation schedule is being developed for the T&H systems going into the Laser Bay Facility.
- The 65% review for T&H FEP controls was completed. The SRS for Bottom Loading, Top Loading, and Side Loading are nearly complete, which includes the requirements specification for the electronics, sensors and actuators, I/O boards, and software.
- The contract was awarded in August to AGV Products, Inc. for the fabrication of the hardware and software of the Laser Bay Transport System. Fabrication has begun, parts have been ordered, and the contract for the large fabrications has been awarded.
- Detailed design, prototyping, and procurement are in process for the Optical Assembly and Alignment Design. All drawings and procurements for equipment that will be installed in the OAB during October/November are complete. A new installation plan was also completed for equipment to be installed between October and November.

Start-Up Activities

- Level 0-3 Integrated Project Schedule (IPS) milestones are on track. The Target Area construction, CSP-6/10, is currently ahead of schedule. With the inclusion of the subcontractor baseline schedule for Conventional Facilities CSP-6/10, the IPS now contains all facility construction

baseline schedules. An Engineering Change Request has been submitted that modifies the Project milestone dictionary to be consistent with CSP-9 dates and definitions, excluding the core area of the Laser Bay for which work-arounds are still under evaluation. First-bundle installation details in Laser Bay 2, which have been in planning off-line for several months, have now been added to the IPS database.

- A significant effort was devoted to preparing for the detailed review of the NIF First Bundle Start-Up Plan in July. The review was held for a committee that included reviewers from the NIF Project, the ICF-NIF Program, SNL-Albuquerque, UR-LLE, and LANL. The major goals of the review were to inform the Project staff on the detailed plans for First-Bundle Start-Up and to collect detailed feedback on the operational test procedures and their interfaces. Both goals were successfully achieved. A draft revision of the First Bundle Start-Up Test Plan was completed and is presently being proofed and edited. This draft revision included a review of all sections except the "Beam Transport to Target-Chamber Center and Final Optics Assembly Tests" and the "Beam Smoothing Tests." Further revision of the "Amplifier-Gain Test" section is being considered to add a subsection to discuss an on-line amplifier cleanliness test. Once the revision is completed, the Start-Up Plan will serve as the basis for the FY99 planning activities, including the writing of detailed operational test procedures. It will provide the interfaces to the Master Test Plan and contain sufficient information to create a resource plan and detailed schedule for execution of the first bundle start-up testing.
- The computer controls software acceptance test team's largest effort was developing system test procedures for the ICCS Nightlight release due in October. Five formal test procedures were drafted for OPG, PEPC, Laser Diagnostics, Automatic Alignment, and Power Conditioning/Shot Director. The technical staffs from NIF hardware and software development reviewed four of these test procedures. The fifth procedure, Laser Diagnostics process, has progressed more slowly due to key development staff focusing on non-laser diagnostic tasks. The procedure is expected to be completed in early October.
- The NIF Laser Operations Model is a code that will be used by Beam Controls and Diagnostics to set up the correct operating and diagnostic parameters to achieve power balance based on performance parameters of the individual beamlines and their components. This model will also provide critical information to support start-up planning and execution.
- Performance-based training (PBT) infrastructure development continues, and 16 functional areas have been identified for the development of training materials. Operations procedures are identified as part of this process. A detailed schedule has been developed using Project milestones so that training materials will be available when needed. Thus far, the first two (of three) phases of the PBT process are complete for the Optics Processing area, and the first phase is complete for the OAB area.
- A draft sequence for conducting facility readiness reviews is being prepared for review by the Project Manager. Planning for readiness reviews is being coordinated with the ICF/NIF Program, which is responsible for ICF facilities that are not part of the LTAB or OAB, but which will support NIF equipment testing, assembly, or development. Start-up has hired an ES&H specialist from the AVLIS program to provide part-time help planning readiness reviews.

Optics Technology

- Facilitization was in final stages at most vendors at the end of the fourth quarter as they started or prepared to start pilot in early FY99. All laser glass contracts are either in place or will be placed when the new fiscal year begins. Nd was in hand at both Schott and Hoya for their pilots. KDP rapid-growth facilitization at CCI and Inrad has gone well, and they have made excellent progress growing their first crystals, up to 27 cm in size. Corning was nearing completion of facilitization. The accelerated fused silica pilot was awarded early in September and has begun.
- Tinsley continued to make excellent progress on their finishing facility. They demonstrated outstanding performance with the first four NIF SF1 and SF2 lenses, which will be the first non-prototype optics they have made, and that will be used on the NIF First Bundle. Zygo was making good progress with their facility including resolution of the pitch problem discussed in previous reports. Initial hiring for pilot production has begun. LLE and Spectra-Physics continued to make good progress preparing for their pilots.
- Metrology issues with the interferometers have been resolved, and the final units have been ordered from Wyko.
- Postprocessing equipment has been arriving weekly to support the laser glass pilot run that starts in October. The laser glass pilot contracts were in place for the October start-up. Schott plans to ship the first laser glass slab to Zygo by

January or February 1999. The cladding glass pilot/production run is scheduled for January 1999.

- At Hoya, the full-scale furnace frame has been constructed and the bricking has begun. Several melter components, the Lehr, and several fine-annealing ovens have been shipped from Japan. Hoya's batch mixing room is nearly complete. Laser glass and cladding glass pilot contracts are in place. Hoya starts their pilot in October with 200 slab equivalents of cladding glass being produced in Japan, which will support first-bundle needs. Their laser glass pilot run is scheduled for January 1999 with the first laser glass slab shipped to Zygo for finishing by April 1999.
- A deuterated potassium dihydrogen (DKDP) boule grown at LLNL reached NIF size at the end of September. The boule is large enough to yield 17 NIF tripler crystals, demonstrating substantial improvement in our ability to control inclusion formation. Optical quality was very good, but 3ω laser damage threshold has yet to be measured. A 15-cm KDP crystal rapidly grown with constant filtration achieved the highest 3ω laser damage threshold of the year and would be expected to have negligible damage at maximum NIF fluences. Both CCI and Inrad grew KDP boules >25 cm in their shakedown runs using NIF production equipment.
- The Moore Tool Company continued to assemble the diamond turning machine at LLNL. Their efforts did not proceed as rapidly as estimated, and it appears that they will need the month of October to make the machine ready for acceptance tests beginning in November. Several items associated with the fly cutter and drive spindles, X and Z slides, and the temperature control must be addressed before the acceptance tests can begin.
- Corning has completed installation of the new overarm lapping machine and begun installation of the polisher. Their new Zygo 24" interferometer is in-house and will be operational by mid-October. The fused silica pilot was awarded to Corning in early September.
- Tinsley's lens and window finishing facility building construction has continued on schedule. Beneficial occupancy and installation of manufacturing equipment is planned for November and December. All manufacturing equipment for the facility has been accounted for and is nearing completion. Most equipment has been run and tested in Tinsley's existing facility and has been used during an early pilot production to produce NIF specification lenses. An award was made to Kodak to construct the NIF Flexible Finishing Facility, which will be designed to augment flats finishing capacity for NIF amplifiers, mirrors, and fused silica windows and to provide a backup for the critical 3ω focus lens.
- Zygo's automated cleaning equipment passed its acceptance tests. LLNL's software for power spectral density (PSD) was installed and run successfully on the first 24" Zygo interferometer. Cavity measurements demonstrated the instrument has an acceptably low noise floor level. The first NIF demonstration amplifier slab has been processed through both phases of edge-cladding bonding, edge machining, and automated beveling.
- Facilitization work at LLE focused on design efforts to reduce the deposition time by the removal of "hot" substrates, planetary design in the 54" chamber for complete devotion of the 72" coater to NIF work, and mount designs for the laser conditioning stations. All of the facility modifications were completed at Spectra-Physics including the cleaning, coating, and metrology areas. The large NIF chamber was returned to operating condition and resumed process optimization activities.
- A NIF-size color separation grating (CSG) was successfully fabricated with the prototype long hydrofluoric etch station. This full-sized optic achieved a 3ω transmission of 89.4% with a sigma of 0.3%, which is significantly lower variability than CSGs previously etched by hand.
- The facility modifications for the Building 391W phase I Optics Processing Research and Development Area were completed. Balancing of the air-handling systems and certification of the clean room is under way. Beneficial occupancy is targeted for mid-November.

PUBLICATIONS AND PRESENTATIONS

JULY–SEPTEMBER 1998

A

Allshouse, G. O., Olson, R. E., Callahan-Miller, D., and Tabak, M., *Deposition and Drive Symmetry for Light Ion ICF Targets*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131395. Submitted to *Nucl. Fusion*.

Amendt, P. A., Turner, R. E., Landen, O., Glendinning, S. G., Kalantar, D., Cable, M., Colvin, J., Decker, C., Suter, L. J., and Wallace, R., *High-Convergence Indirect-Drive Implosions on OMEGA: Design and Simulations*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130677 ABS Rev. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Arnett, D., Drake, R. P., Remington, B. A., and Takabe, H., *Emergence of Laboratory Astrophysics with Intense Lasers*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131535. Submitted to *Science Magazine*.

Auerbach, J. M., Barker, C. E., Couture, S. A., Eimerl, D., De Yoreo, J. J., Hackel, L. A., Hibbard, R. L., Liou, L. W., Norton, M. A., and Perfect, S. A., *Modeling of Frequency Doubling and Tripling with Converter Refractive Index Spatial Non-Uniformities due to Gravitational Sag*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130030. Prepared for *3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF)*, Monterey, CA, Jun 7, 1998.

B

Back, C. A., Bauer, J. D., Turner, R. E., Lasinski, B. F., Suter, L. J., Landen, O. L., Hsing, W. W., and Soures, J. M., *Temporally- and Radially-Resolved Breakout of a Heat Wave in Radiatively Heated Foam Targets*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131363 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Back, C. A., Woolsey, N. C., Missalla, T., Landen, O. L., Dalhed, S., Libby, S. B., and Lee, R. W., *Accessible Dense Matter Physics Using Hohlraum-Driven Implosions*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131394 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Back, C. A., Woolsey, N. C., Missalla, T., Landen, O. L., Libby, S. B., Klein, L. S., and Lee, R. W., *Implosions: an Experimental Testbed for High Energy Density Physics*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129715. Prepared for *2nd Intl Workshop on Laboratory Astrophysics with Intense Lasers*, Tucson, AZ, Mar 19, 1998.

Battersby, C. L., Sheehan, L. M., and Kozlowski, M. R., *Effects of Wet Etch Processing on Laser-Induced Damage of Fused Silica Surfaces*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131224 ABS. Prepared for *30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers*, Boulder, CO, Sept 28, 1998.

Berger, R. L., Cohen, B. I., Langdon, A. B., MacGowan, B. J., Rothenberg, J., Still, C. W., Williams, E. A., and Lefebvre, E., *Polarization and Spectral Dispersion Smoothing: Effects on SBS, SRS, and Filamentation*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130578 ABS Rev. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Bittner, D. N., Collins, G. W., Burmann, J., and Unites, W., *Forming Uniform HD Layers in Shells Using Infrared Radiation*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131371 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Boley, C. D., and Rhodes, M. A., *Modeling of Plasma Behavior in a Plasma Electrode Pockels Cell*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131445. Submitted to *Transactions on Plasma Science*.

Boley, C. D., Estabrook, K. G., Auerbach, J. M., Feit, M. D., and Rubenchik, A. M., *Modeling of Laser Knife-Edge and Pinhole Experiments*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129613. Prepared for *3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF)*, Monterey, CA, Jun 7, 1998.

Britten, J. A., Dixit, S. N., Summers, L. J., Herman, S. M., Auyang, L., Rushford, M. C., and Parham, T. G., *Manufacture, Optical Performance and Laser Damage Characteristics of Diffractive Optics for the National Ignition Facility Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131517 ABS. Prepared for *30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers*, Boulder, CO, Sept 28, 1998.

Budil, K. S., *From Nova to NIF: the Quest for Fusion in the Laboratory*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131872 ABS. Prepared for *Talk at the Naval Postgraduate School*, Monterey, CA, Oct. 2, 1998.

Budil, K. S., *From Nova to Supernova: Bringing the stars down to earth*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131873 ABS. Prepared for *Talk at Washington State University*, Pullman, WA, Sept 29, 1998.

Budil, K. S., Gold, D. M., Estabrook, K. G., Remington, B. A., Kane, J., Bell, P. M., Pennington, D. M., Brown, C., Hatchett, S. P., and Koch, J. A., *Development of a Radiative-Hydrodynamics Testbed Using the Petawatt Laser Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131549. Prepared for *2nd Intl Workshop on Laboratory Astrophysics with Intense Lasers*, Tucson, AZ, Mar 19, 1998.

Budil, K. S., Wan, A. S., Lasinski, B., Remington, B. A., Suter, L., and Stry, P. E., *Ablation Front Rayleigh–Taylor Instability in High-Z Materials*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131351 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

C

Callahan-Miller, D. A., and Tabak, M., *Close-Coupled, Heavy Ion ICF Target*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131243 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Callahan-Miller, D. A., and Tabak, M., *Distributed Radiator Heavy Ion Target with Realistic, Multibeam Illumination Geometry*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131543. Submitted to *Nucl. Fusion*.

Callahan-Miller, D. A., *Heavy-Ion Driven, Inertial Confinement Fusion*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131962 ABS. Prepared for *Women's Technical and Professional Symp*, San Ramon, CA, Oct 15, 1998.

Campbell, J. H., McLean, M. J., Hawley-Fedder, R., Suratwala, T., Ficini-Dorn, G., and Trombert, J. H., *Development of Continuous Glass Melting for Production of Nd-Doped Phosphate Glasses for the NIF and LMJ Laser Systems*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129804. Prepared for *3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF)*, Monterey, CA, Jun 7, 1998.

Celliers, P. M., Collins, G. W., Da Silva, L. B., Gold, D. M., and Cauble, R., *Accurate Measurement of Laser-Driven Shock Trajectories with Velocity Interferometry*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130597; *Appl. Phys. Lett.* **73**(10), 1320–1322 (1998).

Celliers, P. M., Collins, G. W., Gold, D. M., Cauble, R. C., Da Silva, L. B., Wallace, R. J., and Foord, M. E., *Shock Transformation of Deuterium from Molecular Fluid to Liquid Metal*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131511 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Chang, J. J., McLean, W., Dragon, E. P., and Warner, B. E., *Emission Spectra and Particle Ejection during Laser Ablation of Graphite for Diamond-Like Coatings*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131300 ABS. Prepared for *Photonics West '99 Symp*, San Jose, CA, Jan 23, 1999.

Cohen, B. I., Lasinski, B. F., Langdon, A. B., Williams, E. A., Baldis, H. A., and Labaune, C., *Suppression of Stimulated Brillouin Scattering by Seeded Ion Wave Mode Coupling*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129490; *Phys. Plasmas* **5**(9), 3402–3407 (1998).

Cohen, B. I., Lasinski, B. F., Langdon, A. B., Williams, E. A., Wharton, K. B., Kirkwood, R. K., and Estabrook, K. G., *Resonant Stimulated Brillouin Interaction of Opposed Laser Beams in a Drifting Plasma*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129491; *Phys. Plasmas* **5**(9), 3408–3415 (1998).

Collins, G. W., Celliers, P. M., Da Silva, L. B., Cauble, R., Gold, D. M., Foord, M. E., Holmes, N. C., Hammel, B. A., Wallace, R. J., and Ng, A., *Temperature Measurements of Shock Compressed Liquid Deuterium up to 230 GPa*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131955. Submitted to *Phys. Rev. Lett.*

Collins, G. W., Celliers, P., Gold, D. M., Da Silva, L. B., Cauble, R., Hammel, B. A., and Wallace, R. J., *Shock Compressing Diamond into the Metallic Phase*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131400 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Collins, G. W., Da Silva, L. B., Celliers, P., Gold, D. M., Foord, M. E., Wallace, R. J., Ng, A., Weber, S. V., Budil, K. S., and Cauble, R., "Measurements of the Equation of State of Deuterium at the Fluid Insulator-Metal Transition," *Science* **281**, 1178–1181 (1998).

Colston Jr., B. W., Sathyam, U. S., Da Silva, L. B., Everett, M. J., Stroeve, P., and Otis, L. L., *Dental OCT*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131547; *Optics Express* **3**(6), 230–238 (1998).

Colvin, J. D., *Hydrodynamic Stability Analysis of Laser-Driven Double-Shell Capsule Implosions*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131375 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Colvin, J. D., Weber, S., Kalantar, D., and Remington, B., *Drive Modeling and Characterization for Solid-State Instability Experiments on the Nova Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131398 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Correll, D., and Spafford, T., *Lasers*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131523. Submitted to *Grolier's New Book of Knowledge*.

Correll, D., *Inertial Confinement Fusion Annual Report 1997*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-LR-105821-97.

Crane, J. K., Wilcox, R. B., Hopps, N. W., Browning, D., Martinez, M. D., Moran, B., Penko, F., Rothenberg, J. E., Henesian, M., and Dane, C. B., *Integrated Operations of the National Ignition Facility (NIF) Optical Pulse Generation Development System*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129871. Prepared for *3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF)*, Monterey, CA, Jun 7, 1998.

Crane, J. K., Wilcox, R. B., Hopps, N., Moran, B., Martinez, M., Browning, D., Dane, B., Rothenberg, J. E., Henesian, M., and Penko, F., *Optical Pulse Generation System for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130953. Prepared for *1998 American Nuclear Society Annual Mtg*, Nashville, TN, Jun 7, 1998.

D

Dane, C. B., Hackel, L. A., Daly, J., and Harrison, J., *High Power Laser for Peening of Metals Enabling Production Technology*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131104 Rev 1. Prepared for *Advanced Aerospace Materials & Processes Conf '98*, Tysons Corner, VA, Jun 15, 1998.

De Groot, J. S., Deeney, C., Hammer, J. H., Reisman, D. B., Ryutov, D., Sanford, T. W. L., Spielman, B., and Toor, A., *Initiation of Rayleigh–Taylor Instability in Wire Array Plasmas*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131392 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Decker, C., Suter, L., Back, C., Serduke, F., Grun, J., Laming, M., and Davis, J., *Designs for Highly Efficient K-Shell Radiators*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131391 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Dimonte, G., *Atwood (A) Number Variation of Turbulent Rayleigh–Taylor Mixing*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131520 ABS. Prepared for *51st Annual Mtg of the Div of Fluid Dynamics*, Philadelphia, PA, Nov 22, 1998.

Dimonte, G., *Atwood (A) Number Variation of Turbulent Rayleigh–Taylor Mixing: Experiments and Model*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131860 ABS. Prepared for *Turbulence and Shear Flow Phenomena First Intl Symp*, Santa Barbara, CA, Sept 12, 1999.

Dimonte, G., *Rayleigh–Taylor and Richtmyer–Meshkov Instabilities in Turbulent Regime*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131250 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Dittrich, T. R., Haan, S. W., Marinak, M. M., Hinkel, D. E., Pollaine, S. M., McEachern, R. L., Cook, R. C., Roberts, C. C., Wilson, D. C., and Bradley, P. A., *Capsule Design for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130102. Prepared for *25th European Conf on Laser Interaction with Matter*, Formia, Italy, May 4, 1998.

Dittrich, T. R., Haan, S. W., Marinak, M. M., Pollaine, S. M., Hinkel, D. E., Strobel, G. L., MacEachern, R., Cook, R. C., Roberts, C. C., and Wilson, D. C., *Review of Indirect-Drive Ignition Design Options for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131383 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Drake, R. P., Glendinning, S. G., Estabrook, K., Remington, B. A., McCray, R., Wallace, R. J., Suter, L. J., Smith, T. B., Carroll III, J. J., London, R. A., and Liang, E., "Observation of Forward Shocks and Stagnated Ejecta Driven by High-Energy-Density Plasma Flow," *Phys. Rev. Lett.* **81**(10), 2068–2071 (1998).

Dubois, P. F., *Facility for Creating Python Extensions in C++*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131396. Prepared for *7th Intl Python Conf*, Houston, TX, Nov 9, 1998.

E

Edwards, M. J., Glendinning, S. G., Suter, L. J., Shepard, T. J., Turner, R. E., Graham, P., Dunne, A. M., and Thomas, B. R., *Development of Laser Produced Sources for Hydrodynamic Experiments Driven by Combined Material Pressure and X-Ray Ablation*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131361 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Emanuel, M. A., Skidmore, J. A., and Freitas, B. L., *Final Report for High Beam Quality Laser Diodes (LDRD 96-ERD-003)*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-ID-126453.

Estabrook, K. G., Glenzer, S. H., Back, C. A., Rozmus, W., Wilson, B. G., De Groot, J. S., Zimmerman, G. B., Langer, S. H., Lee, R. W., and Hart, J. A., *Thomson Scattering Measurements Compared with LASNEX Simulations*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131379 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Estabrook, K., Remington, B. A., Farley, D., Glendinning, G., Suter, L. J., Harte, J. H., Zimmerman, G. B., Stone, J., Wood-Vasey, M., and Drake, R. P., *Simulations of Radiative Astrophysical Jets*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131427 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

F

Feit, M. D., *ICF Quarterly Report 8 (1)*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-LR-105821-98-1 (1998).

Feit, M. D., Rubenchik, A. M., Kozlowski, M. K., Genin, F. Y., Schwartz, S., and Sheehan, L. M., *Extrapolation of Damage Test Data to Predict Performance of Large-Area NIF Optics at 355 nm*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131222 ABS. Prepared for *30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers*, Boulder, CO, Sept 28, 1998.

Feit, M. D., Wu, Z. L., Rubenchik, A. M., Sheehan, L. M., and Kozlowski, M. R., *Optical Absorption of Laser Damaged Fused Silica*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131223 ABS. Prepared for *30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers*, Boulder, CO, Sept 28, 1998.

Fernandez, J. C., Bauer, B. S., Bradley, K. S., Cobble, J. A., Montgomery, D. S., Watt, R. G., Bezzerides, B., Estabrook, K. G., Focia, R., Goldman, S. R., Harris, D. B., Lindman, E. L., Rose, H. A., Wallace, J., and Wilde, B. H., "Increased Saturated Levels of Stimulated Brillouin Scattering of a Laser by Seeding a Plasma with an External Light Source," *Phys. Rev. Lett.* **81**(11), 2252–2255 (1998).

G

Geddes, C. G. R., Kirkwood, R. K., Glenzer, S. H., Estabrook, K. G., Joshi, C., and Wharton, K. B., *Study of the Saturation of Stimulated Raman Scattering by Secondary Decays*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130328 ABS Rev. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Geddes, C. G., Sanchez, J. J., Collins, G. W., and McKenty, P., *Interferometric Characterization of Hydrogen Ice Layers in NIF Scale Targets*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131367 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Glendinning, S. G., Amendt, P., Cline, B. D., Ehrlich, R. B., Hammel, B. A., Kalantar, D. H., Landen, O. L., Wallace, R. J., Weiland, T. J., and Dague, N., *Hohlraum Symmetry Measurements with Surrogate Solid Targets*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129773-DR. Prepared for *12th Topical Conf on High-Temperature Plasma Diagnostics*, Princeton, NJ, Jun 7, 1998.

Glendinning, S. G., Budil, K. S., Cherfils, C., Drake, R. P., Farley, D., Kalantar, D. H., Kane, J., Marinak, M. M., Remington, B. A., and Richard, A., *Experimental Measurements of Hydrodynamic Instabilities on Nova of Relevance to Astrophysics*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130104. Prepared for *2nd Intl Workshop on Laboratory Astrophysics with Intense Lasers*, Tucson, AZ, Mar 19, 1998.

Glendinning, S. G., Collins, G. W., Marinak, M. M., Haan, S. W., Weber, S. V., Wallace, R. J., and Dague, N., *Rayleigh–Taylor Growth of Ablation Front Modulations in Indirectly-Driven Be/Cu Planar Foils*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-127922 ABS Rev. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Glenzer, S. H., Rozmus, W., MacGowan, B. J., Estabrook, K. G., De Groot, J. D., Zimmerman, G. B., Baldis, H. A., Hammel, B. A., Harte, J. A., and Lee, R. W., *Thomson Scattering from High-Z Laser-Produced Plasmas*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131980. Submitted to *Phys. Rev. Lett.*

Glenzer, S. H., Rozmus, W., MacGowan, B. J., Estabrook, K. G., Harte, J. A., Lee, R. W., Williams, E. A., and Wilson, B. G., *Detailed Characterization of High-Z-Plasmas for Benchmarking of Radiation-Hydrodynamic Modeling*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131979 ABS. Prepared for *8th Intl Workshop on Radiative Properties of Hot Dense Matter*, Sarasota, FL, Oct 26, 1998.

Glenzer, S. H., Rozmus, W., MacGowan, B. J., Estabrook, K. G., Suter, L. J., Baldis, H. A., and Moody, J. D., *Thomson Scattering from Laser Plasmas*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131357 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Glenzer, S. H., *X-Ray Spectroscopy from Fusion Plasmas*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130122. Prepared for *14th Intl Conf on Spectral Line Shapes*, State College, PA, Jun 22, 1998.

H

Haan, S. W., Koch, J. A., Sangster, T. C., Pollaine, S. M., Dittrich, T. R., Marinak, M. M., and Cable, M. D., *Target Simulations for Diagnostic Design for Ignition Targets for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131431 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Hammer, J. H., Ryutov, D., Liberman, M., Reisman, D., De Groot, J. S., Tabak, M., and Toor, A., *Discrete Wire Effects on Wire Array Instability*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131386 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Hammer, J. H., Tabak, M., Wilks, S., Lindl, J., Toor, A., Zimmerman, G., Porter, J., McDaniel, D., and Spielman, R. B., *High Gain ICF Target Design for a Z-Pinch Driven Hohlraum*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131389 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Hatchett, S. P., Lasinski, B. F., Phillips, T. W., Wilks, S. C., and Perry, M. D., *Models of γ -Ray Sources for Radiography Driven by Ultra-Intense Lasers*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131244 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Hermann, M., and Fisch, N., *Recent Progress in Simulating α -Channelling*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131378 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Hinkel, D. E., and Haan, S. W., *National Ignition Facility 350 eV Target*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131384 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Ho, D. D., Chen, Y.-J., and Pincosy, P. A., *Methods for Containing the Plasma Plume Expansion from the Targets for X-Ray Radiography*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130970 ABS Rev. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Hopps, N. W., Wilcox, R. B., Hermann, M. R., Martinez, M. D., Padilla, E. H., and Crane, J. K., *Optimisation of the Alignment Sensitivity and Energy Stability of the NIF Regenerative Amplifier Cavity*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130961. Prepared for *3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF)*, Monterey, CA, Jun 7, 1998.

J

Jones, O. S., Pollaine, S. M., and Suter, L. J., *Effects of P6 and P8 Asymmetries on Indirect Drive Implosions*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131426 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

K

Kalantar, D. H., Chandler, E., Colvin, J., Michaelian, K., Remington, B., Weber, S., Wiley, L., Wark, J. S., and Hauer, A. A., *Solid State Hydrodynamics Experiments on the Nova Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131248 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Kalantar, D. H., Colvin, J., Remington, B. A., Weber, S., Wiley, L., Wark, J. S., Loveridge, A., Hauer, A. A., Failor, B. H., and Myers, M. A., *Transient X-Ray Diffraction from Shock Compressed Si Crystals on the Nova Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131247 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Kalantar, D. H., Remington, B. A., Chandler, E. A., Colvin, J. D., Gold, D. M., Mikaelian, K. O., Weber, S. V., Wiley, L. G., Wark, J. S., and Loveridge, A., *Developing Solid State Experiments on the Nova Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131851-DR. Prepared for *2nd Intl Workshop on Laboratory Astrophysics with Intense Lasers*, Tucson, AZ, Mar 19, 1998.

Kane, J., Arnett, D., Remington, B. A., Glendinning, S. G., Ryutov, D., Fryxell, B., and Drake, R. P., *Supernova-Relevant Experiments on the Nova Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131362 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Kauffman, R. L., *High Intensity Laser-Matter Interaction Experiments at LLNL*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131981 ABS. Prepared for *Atomic Molecular and Optical Physics Mtg*, Ellicott City, MD, Oct 25, 1998.

Kauffman, R., *Monthly Highlights*, August 1998, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-TB-128550-98-11.

Kauffman, R., *Monthly Highlights*, July 1998, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-TB-128550-98-10.

Kauffman, R., *Monthly Highlights*, Jun 1998, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-TB-128550-98-9.

Keilty, K., Liang, E., Ditmire, T. R., Remington, B. A., Rubenchik, A. M., Shigemori, K., and Moore, K., *Modeling of Blast Waves Generated on the Falcon Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131246 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Kilkenny, J. D., Bernat, T. P., Hammel, B. A., Kauffman, R. L., Landen, O. L., Lindl, J. D., MacGowan, B. J., Paisner, J. A., and Powell, H. T., *Lawrence Livermore National Laboratory's Activities to Achieve Ignition by X-Ray Drive on the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131510. Prepared for *25th European Conf on Laser Interaction with Matter*, Formia, Italy, May 4, 1998.

Kilkenny, J. D., Campbell, E. M., Lindl, J. D., Logan, G. B., Meier, W. R., Perkins, J. L., Paisner, J. A., Key, M. H., Powell, H. T., and McCrory, R. L., *Role of the National Ignition Facility in Energy Production from Inertial Fusion*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131355.

Kirkwood, R. K., Berger, R. L., Dixit, S. N., Rothenberg, J., Glenzer, S. H., MacGowan, B. J., Moody, J. D., and Geddes, C. G. R., *Scaling of Saturated SRS with Laser Intensity Correlation Length*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131397 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Koch, J. A., Haan, S. W., Hammel, B. A., Landen, O. L., McEachern, R. L., Phillips, T. W., Suter, L. J., and Wallace, R. J., *Beryllium-Ablator Implosion Experiments on Nova*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131358 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

Kozlowski, M. R., Maricle, S., Mouser, R., Schwartz, S., Parham, T., Wegner, P., and Weiland, T., *Laser Damage Performance of Fused Silica Optical Components Measured on the Beamlet Laser System at 355 nm*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131221 ABS. Prepared for *30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers*, Boulder, CO, Sept 28, 1998.

Kozlowski, M. R., Maricle, S., Mouser, R., Schwartz, S., Wegner, P., and Weiland, T., *3 ω Damage Threshold Evaluation of Final Optics Components Using Beamlet Mule and Off-Line Testing*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129721. Prepared for *3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF)*, Monterey, CA, Jun 7, 1998.

Kruer, W. L., Campbell, E. M., Decker, C. D., Wilks, S. C., Moody, J., Orzechowski, T., Suter, L., Afeyan, B., and Dague, N., *Pushing the Limits: Strongly-Driven Laser Plasma Coupling*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130986 ABS. Prepared for *40th Annual Mtg of the Div of Plasma Physics*, New Orleans, LA, Nov 16, 1998.

L

Landen, O. L., Amendt, P. A., Barnes, C., Bradley, D., Craxton, S., Decker, C., Glendinning, S., Haan, S., Hammel, B., and Hauer, A., *Time Dependent Hohlraum Symmetry Control*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131373 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Langdon, A. B., Berger, R., Dixit, S., Kirkwood, R., MacGowan, B., Still, C., and Williams, E., *Modeling of Laser-Plasma Interactions with Beams Smoothed by Kinoform Phase Plates and by Random-Phase Plates*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131393 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Langer, S. H., *A Comparison of the Floating Point Performance of Current Computers*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130869; *Comput. Phys.* **12**(4), 338–345 (1998).

Langer, S. H., Scott, H. A., Marinak, M. M., and Landen, O. L., *Modeling Line Emission from ICF Capsules in 3 Dimensions*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131240 ABS Rev. Prepared for 8th Intl Workshop on Radiative Properties of Hot Dense Matter, Sarasota, FL, Oct 26, 1998.

Langer, S. H., Scott, H. A., Marinak, M. M., and Landen, O. L., *Modeling Line Emission from ICF Capsules in 3 Dimensions*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131240 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Lasinski, B. F., *PIC Simulations of Ultra Intense Laser Pulses Propagating through Overdense Plasma for Fast-Ignitor Radiography Applications*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131245 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Lefebvre, E., Berger, R. L., Langdon, A. B., MacGowan, B. J., Rothenberg, J. E., and Williams, E. A., *Reduction of Laser Self-Focusing in Plasma by Polarization Smoothing*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-127739; *Phys. Plasmas* **5**(7), 2701–2705 (1998).

Lerche, R. A., and Ognibene, T. J., *Error Analysis for Fast Scintillator-Based ICF Burn History Measurements*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129701. Prepared for 12th Topical Conf on High-Temperature Plasma Diagnostics, Princeton, NJ, Jun 7, 1998.

Logan, B. G., Perkins, L. J., Ditmire, T. R., Rosen, M. D., Perry, M. D., Key, M. H., Diaz De La Rubia, T., and Wolfer, W. G., *High Flux, Petawatt-Laser-Driven, Neutron Source for Fusion Micro-Materials Irradiation*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131440 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Lund, S. M., and Davidson, R. C., *Warm-Fluid Description of Intense Beam Equilibrium and Electrostatic Stability Properties*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130614; *Phys. Plasmas* **5**(8), 3028–3053 (1998).

M

MacFarlane, J. J., Cohen, D. H., Wang, P., Peterson, R. R., Moses, G. A., Back, C. A., Landen, O. L., Leeper, R. J., Olsen, R. E., and Nash, T., *Development of Soft X-Ray Tracer Diagnostics for Hohlraum Experiments*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-CR-131541.

MacGowan, B. J., Berger, R. L., Cohen, B. I., Decker, C. D., Dixit, S., Geddes, C., Glenzer, S. H., Hinkel, D. E., Kirkwood, R. K., and Langdon, A. B., *Beam Smoothing Experiments at the Nova Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131372 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Maricle, S. M., Wu, Z. L., Stolz, C. J., and Weakley, S. C., *Study of Damage Growth of Large Aperture HfO₂/SiO₂ Multilayer Coatings*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131220 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.

Marinak, M. M., Dittrich, T. R., Gentile, N., Kerbel, G. D., Haan, S. W., and Jones, O., *Advances in HYDRA and Its Application to National Ignition Facility (NIF) Capsule Designs*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131430 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Marshall, C., Erlandson, A., Horvath, J., Jancaitis, K., Lawson, J., Manes, K., Moor, E., Payne, S., Pedrotti, L., and Rotter, M., *Design and Performance of Amplifiers for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131963 ABS-S. Prepared for 14th Topical Mtg on Advanced Solid-State Lasers Conf, Boston, MA, Jan 31, 1999.

McEachern, R., Alford, C., Cook, R., Wallace, R., and Bernat, T., *Studies of Morphology and Hydrogen Permeation in Sputter-Deposited Be and B-Doped Be Films*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131399 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Meier, W. R., Bangerter, R. O., and Faltens, A., *Integrated Systems Model for Heavy Ion Drivers*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-128538. Prepared for 12th Intl Symp on Heavy Ion Inertial Fusion, Heidelberg, Germany, Sept 24, 1997.

Milam, D., Eimerl, D., Auerbach, J. M., Barker, C., and Milonni, P. W., *Use of Alternating-Z Doubling in High-Dynamic-Range Tripling: Design and Evaluation of an Optimized Prototype Tripler*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131507. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.

Milam, D., Murray, J. E., Estabrook, K. G., Boley, C. D., Sell, W. D., Nielsen, N. D., Kirkwood, R. K., Zakharenkov, Y. A., and Afeyan, B. B., *Pinhole Closure Measurements*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129864. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.

Moody, J. D., MacGowan, B. J., Afeyan, B. B., Kirkwood, R. K., Glenzer, S. H., Kruer, W. L., Schmitt, A. J., and Williams, E. A., *Measurements of Small Scale Density Inhomogeneities in a Laser Plasma Using Near Forward Scattering*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131374 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Moran, M. J., Brown, C. G., Cowan, T., Hatchett, S., Hunt, A., Key, M., Pennington, D. M., Perry, M. D., Phillips, T., and Sangster, C., *Measurements of MeV Photon Flashes in Petawatt Laser Experiments*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131359 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Murphy, T. J., Wallace, J. M., Delamater, N. D., Barnes, C. W., Gobby, P., Hauer, A. A., Lindman, E., Magelssen, G., Moore, J. B., Oertel, J. A., Watt, R., Landen, O. L., Amendt, P., Cable, M., Decker, C., Hammel, B. A., Koch, J. A., Suter, L. J., Turner, R. E., Wallace, R. J., Marshall, F. J., Bradley, D., Craxton, R. S., Keck, R., Knauer, J. P., Kremens, R., and Schnittman, J. D., "Hohlraum Symmetry Experiments with Multiple Beam Cones on the Omega Laser," *Phys. Rev. Lett.* **81**(1), 108–111 (1998).

Murray, J. E., Milam, D., Boley, C. D., Estabrook, K. G., and Bonneau, F., *Spatial Filter Issues*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129751. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.

O

Ognibene, T. J., and Lerche, R. A., *Calculations into the Development of an ICF Burn History Diagnostic for NIF*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131370 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

P

Paisner, J. A., *Effect of Laser-Induced Damage on the National Ignition Facility Optical Design*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131219 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.

Pennington, D. M., Brown, C. G., Cowan, T., Ditmire, T., Fountain, W., Hatchett, S., Hunt, A., Johnson, J., Kartz, M., and Key, M., *Petawatt Class Lasers and Applications to Laser-Matter Interaction Experiments*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131783 ABS. Prepared for Women's Technical and Professional Symp, San Ramon, CA, Oct 15, 1998.

Perkins, L. J., Logan, B. G., Tabak, M., Miller, D. C., Moir, R., Caporaso, G. J., and Latkowski, J. F., *Advanced Concepts for Inertial Fusion Energy*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131439 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Perry, M. D., Sefcik, J., Moran, M., and Snavelly, R., *Fast Gated Detectors for Ballistic Imaging with Hard X-Rays*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-ID-131518.

Pollaine, S. M., Haan, S., Rothenberg, J., Dixit, S., MacGowan, B., Suter, L., and Williams, W., *National Ignition Facility Focal Spot Size Specifications*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131390 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

R

Remington, B. A., Glendinning, S. G., Kalantar, D. H., Budil, K. S., Weber, S. W., Colvin, J., Kane, J., Wood-Vasey, M. W., Moore, K., and Keilty, K., *Hydrodynamics Experiments on Intense Lasers*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131249 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Remington, B. A., *Proceedings from the 2nd Intl Workshop on Laboratory Astrophysics with Intense Lasers*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-ID-131978. Prepared for 2nd Intl Workshop on Laboratory Astrophysics with Intense Lasers, Tucson, AZ, Mar 19, 1998.

Rhodes, M. A., Fochs, S., and Bilitoft, P., *Plasma Electrode Pockels Cell for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131208. Prepared for 1998 American Nuclear Society Annual Mtg, Nashville, TN, Jun 7, 1998.

Rosen, M. D., *Physics Issues That Determine ICF Target Gain and Driver Requirements*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131381 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Rothenberg, J. E., Auerbach, J. M., Moran, B. D., Murray, J. E., Weiland, T. L., and Wegner, P. J., *Implementation of Smoothing by Spectral Dispersion on Beamlet and NIF*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129771. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.

Rothenberg, J. E., Browning, D. F., and Wilcox, R. B., *Issue of FM to AM Conversion on the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129770. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.

Rothenberg, J. E., *Polarization Smoothing for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129769. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.

Rotter, M., Jancaitis, K., Marshall, C., Zapata, L., Erlandson, A., LeTouze, G., and Seznec, S., *Pump-Induced Wavefront Distortion in Prototypical NIF/LMJ Amplifiers—Modeling and Comparison with Experiments*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130044. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.

Rubenchik, A., Budil, K. S., Brown, C., Glendinning, S. G., Gold, D., Estabrook, K., Keilty, K., Liang, E., Pennington, D., and Perry, M. D., *Simulating High Speed Meteorite Impact Physics with Experiments on the Petawatt Laser*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131352 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Runkel, M., *Monte Carlo Simulation of the R/1 Automated Damage Test*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131515. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.

Runkel, M., Williams, W., and De Yoreo, J., *Predicting Bulk Damage in NIF Harmonic Generators*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131514. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.

Ryutov, D. D., Budil, K. S., Glendinning, S. G., Remington, B. A., Stone, J. M., and Drake, R. P., *Analysis of Hydrodynamic Instabilities at Photoevaporation Fronts in Astrophysical Settings*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131353 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

S

Salleo, A., Chinsio, R., Campbell, J. H., and Genin, F. Y., *Crack Propagation in Fused Silica during UV and IR ns-Laser Illumination*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131218 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.

Sanchez, J. J., Giedt, W. H., and Pipes, J., *Design, Fabrication and Testing of a Prototype NIF Cryogenic Hohlraum*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131368 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Sangster, C. T., Cowan, T. E., Hatchet, S. P., Henry, E. A., Key, M. H., Moran, M. J., Pennington, D. M., Perry, M. D., Phillips, T. W., and Stoyer, M. A., *Nuclear Activation Techniques for Electron Jet Characterization in Short Pulse Laser Interactions with High Z Matter*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131369 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Sater, J. D., Koziowski, B., Collins, G. W., Pipes, J., and Burmann, J., *Cryogenic D-T Fuel Layers Formed in 1 mm Spheres by Beta-Layering*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-128031 ABS Rev. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Schoenenberger, K. Colston, B. W., Maitland, D. J., Da Silva, L. B., "Mapping of Birefringence and Thermal Damage in Tissue by Use of Polarization-Sensitive Optical Coherence Tomography," *Appl. Opt.* **37**(25), 6026–6036 (1998).

Schwartz, S., Feit, M. D., Kozlowski, M. R., Mouser, R. P., and Wu, Z. L., *Current 3 ω Large Optic Test Procedures and Data Analysis for the QA of National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131217 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.

Schwartz, S., Jennings, R. T., Kimmons, J. F., Mouser, R. P., Weinzapfel, C. L., Kozlowski, M. R., Stolz, C. J., and Campbell, J. H., *Vendor Based Laser Damage Metrology Equipment Supporting the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129719. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.

Sheehan, L. M., Schwartz, S., Battersby, C., Dickson, R., Jennings, R., Kimmons, J., Kozlowski, M., Maricle, S., Mouser, R., and Rainer, F., *Automated Damage Test Facilities for Materials Development and Production Optic Quality Assurance at Lawrence Livermore National Laboratory*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131230 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.

Sheehan, L. M., Wu, Z. L., and Kozlowski, M. R., *Defect Characterization on Super-Polished Fused Silica Surfaces Polished for High Power Laser Application at 355 nm*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131216 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.

Shigemori, K., Ditmire, T., Remington, B. A., Rubenchik, A. M., Keilty, K., Liang, E., and Moore, K., *Measurements of Strong Blast Waves in Gas Targets*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131233 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Still, C. H., Berger, R. L., Cohen, B. I., Langdon, A. B., and Williams, E. A., *Large Scale Filamentation Simulations with pF3D*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131385 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Still, C. H., Langer, S. H., Alley, W. E., and Zimmerman, G. B., *Shared Memory Programming with OpenMP*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131544; *Computers in Physics* **12**(6), 577 (1998).

Strobel, G. L., Dittrich, T. R., Haan, S. W., Marinak, M. M., and Pollaine, S. M., *Requirements for Low-Mode Asphericity on Ignition Targets for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131428 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Suter, L. J., Amendt, P., Jones, O., Pollaine, S., and Tabak, M., *Increasing the Coupling Efficiency of Conventional NIF Hohlräume*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131388 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

T

Tabak, M., *Ignition Scaling Issues for the Fast Ignitor*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-127948 ABS Rev. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

Turner, R. E., Amendt, P. A., Glendinning, S. G., Kalantar, D. H., Landen, O. L., Wallace, R. J., Cable, M. D., Hammel, B. A., Bradley, D., and Glebov, V., *X-Ray Drive Symmetry and Implosion Performance in OMEGA Cylindrical Hohlräume Driven by NIF-Like Multiple Cone Geometry*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131360 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

V

Verdon, C. P., *Physics Experiments Planned for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131377 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.

W

Wang, L., Yan, M., Siekhaus, W., and Oberhelman, S., *Probing Nano-Defects in Fused Silica by Near-Field Scanning Optical Microscopy*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-233584; *J. Appl. Phys.* **84**(6), 3016–3019 (1998).

- Weber, S. V., Collins, G. W., Glendinning, S. G., Wallace, R. J., Ze, F., Dague, N., Jadaud, J. P., and De Sainte Claire, E., *Modeling of Characterization Experiments for NIF Ablator Materials*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131376 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.
- Wharton, K. B., Hatchett, S. P., Wilks, S. C., Key, M. H., Moody, J. D., Yanovsky, V., Offenberger, A. A., Hammel, B. A., Perry, M. D., and Joshi, C., *Experimental Measurements of Hot Electrons Generated by Ultraintense ($>10^{19}$ W/cm²) Laser-Plasma Interactions on Solid-Density Targets*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129230; *Phys. Rev. Lett.* **81**(4), 822–825 (1998).
- Wharton, K. B., Kirkwood, R. K., Glenzer, S. H., Estabrook, K. G., Afeyan, B. B., Cohen, B. I., Moody, J. D., and Joshi, C., *Observation of Energy Transfer between Identical-Frequency Laser Beams in a Flowing Plasma*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129856; *Phys. Rev. Lett.* **81**(11), 2248–2251 (1998).
- Wharton, K. B., Kirkwood, R. K., Glenzer, S. H., Estabrook, K. G., Afeyan, B. B., Cohen, B. I., Moody, J. D., and Joshi, C., *Observation of Resonant Energy Transfer between Identical-Frequency Laser Beams*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130320 ABS Rev. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.
- Widmayer, C. C., Nickels, M. R., and Milam, D., *Nonlinear Holographic Imaging of Phase Errors*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130142; *Appl. Optics* **37**(21), 4801–4805 (1998).
- Wilks, S. C., Kruer, W. L., Cowan, T., Key, M., Langdon, A. M., Lasinski, B., Hatchett, S., Perry, M. D., Tabak, M., and Haines, M. G., *Ultra-Intense Laser-Plasma Interactions Present in the LLNL Petawatt Experiments*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131382 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.
- Willi, O., Haines, M., MacKinnon, A., Borghesi, M., Glenzer, S., Estabrook, K., Hammer, J., Kruer, W., Moody, J., and Powers, L., *Investigation of Magnetic Fields in Laser Produced Plasmas*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-CR-131532.
- Williams, E. A., Berger, R. L., Hinkel, D. E., and Langdon, A. B., *Augmented Ray-Based Laser Plasma Interaction Modeling*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131387 ABS. Prepared for 40th Annual Mtg of the Div of Plasma Physics, New Orleans, LA, Nov 16, 1998.
- Williams, W. H., *Simulations of a Phase Corrector Plate for the National Ignition Facility*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-130033. Prepared for 3rd Annual Intl Conf on Solid State Lasers for Application (SSLA) to Inertial Confinement Fusion (ICF), Monterey, CA, Jun 7, 1998.
- Wu, Z. L., Feit, M. D., Kozlowski, M. R., Rubenchik, A. M., and Sheehan, L., *Laser Modulated Scattering as a Nondestructive Evaluation Tool for Optical Surfaces*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131211 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.
- Wu, Z. L., Feit, M. D., Rubenchik, A. M., Sheehan, L., and Yan, M., *Single-Beam Photothermal Microscopy—a New Diagnostic Tool for Optical Materials*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131212 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.
- Wu, Z. L., Sheehan, L., and Kozlowski, M. R., *Laser Modulated Scattering as a Nondestructive Evaluation Tool for Defect Inspection in Optical Materials for High Power Laser Applications*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131548. Submitted to *Optics Express*.

Y

- Yan, M., Oberhelman, S., Siekhaus, W., Wu, Z. L., Sheehan, L., and Kozlowski, M., *Characterization of Surface and Sub-Surface Defects in Optical Materials Using Near Field Evanescent Wave*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131225 ABS. Prepared for 30th Boulder Damage Symp: Annual Symp on Optical Materials for High Power Lasers, Boulder, CO, Sept 28, 1998.
- Young, P. E., Still, C. H., Hinkel, D. E., Kruer, W. L., Williams, E. A., Berger, R. L., and Estabrook, K. G., *Observations of Laser-Beam Bending Due to Transverse Plasma Flow*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-129338; *Phys. Rev. Lett.* **81**(7), 1425–1428 (1998).

Z

Zaitseva, N., Atherton, J., Carman, L., De Yoreo, J., Torres, R., and Yan, M., *Rapid Growth of Large KDP and DKDP Crystals (55–57 cm) for Laser Fusion Applications*, Lawrence Livermore National Laboratory, Livermore, CA, UCRL-JC-131203 ABS. Prepared for 7th Intl Workshop on Laser Physics, Berlin, Germany, July 6, 1998.

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