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# LLE Review

## Quarterly Report

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## Contents

# In Brief

This volume of the LLE Review, covering April–June 2006, features "High-Contrast Plasma-Electrode Pockels Cell (PEPC)" by B. E. Kruschwitz, J. H. Kelly, M. J. Shoup III, L. J. Waxer, E. C. Cost, E. T. Green, Z. M. Hoyt, J. Taniguchi, and T. W. Walker. In this article (p. 129), the authors report on the development of the OMEGA EP PEPC prototype and the demonstration of high-switching contrasts exceeding 500:1 throughout the clear aperture. The key to producing this level of performance has been the reduction of stress birefringence using circular windows. In addition to the more typical role of holding the pulse in the cavity for four passes, the PEPC will be used to provide isolation from target retroreflections. Most existing multipass high-energy laser systems use frequency conversion to direct second- or third-harmonic light onto the target. This is not the case for the short-pulse part of OMEGA EP; therefore, any light reflected by the target can experience gain in the unsaturated amplifiers as it propagates back up the system, posing a significant damage threat to the system.

Additional highlights of recent research presented in this issue include the following:

- F. J. Marshall, J. P. Knauer, D. Anderson, and B. L. Schmitt present results of the absolute calibration of Kodak Biomax-MS film response to x rays in the 1.5- to 8-keV energy range. Film calibration was accomplished with an e-beam–generated x-ray source, a crystal/multilayer monochromator, a film pack, and an absolutely calibrated x-ray photon detector. The results agree with predictions from a theoretical model presented in a companion article in this issue.

- J. P. Knauer, F. J. Marshall, B. Yaakobi, D. Anderson, and B. A. Schmitt along with K. M. Chandler, S. A. Pikuz, T. A. Shelkovenko, M. D. Mitchell, and D. A. Hammer (Plasma Studies Lab, Cornell University) present a response model for Kodak Biomax-MS film to x rays. This detail film characterization starts with simple mathematical models and extends them to T-grain film. This is the companion article for the experimental results reported by F. J. Marshall *et al.* reported in this issue.

- V. Yu. Glebov, C. Stoeckl, T. C. Sangster, C. Mileham, and S. Roberts along with R. A. Lerche (LLNL) present results for a new high-yield bang time detector for the OMEGA laser. The time interval from the beginning of the laser pulse to the peak of neutron emission (bang time) is an important parameter in inertial confinement fusion experiments. The NTD streak camera currently deployed on OMEGA is saturated by neutron yields above $3 \times 10^{13}$, whereas the latest OMEGA experiments and those planned for OMEGA EP are expected to produce neutron yields above $10^{14}$. This new detector will support these experiments and also high-yield experiments at the National Ignition Facility (NIF).

- C. Stoeckl, V. Yu. Glebov, P. A. Jaanimagi, J. P. Knauer, D. D. Meyerhofer, T. C. Sangster, M. Storm, S. Sublett, and W. Theobald along with M. H. Key, A. J. MacKinnon, and P. Patel (LLNL) and D. Neely and P. A. Norreys (Rutherford Appleton Laboratory) present the issues associated with operating target diagnostics in a petawatt environment. Sensitive electronic devices are difficult to operate in petawatt laser–target interaction experiments because there are copious amounts of relativistic electrons, hard x rays, and other charged particles created by the experiments. This has serious consequences for the design and integration of diagnostics inside or close to the target chamber.

- W. Guan and J. R. Marciante present simulation results for gain apodization in highly doped distributed-feedback (DFB) fiber lasers. DFB lasers can be designed with an internal grating structure to provide highly output power (up to 60 mW), single frequency, single polarization, and high optical signal-to-noise ratio. The authors investigate the effects of gain apodization on threshold behavior along with the impact on output power and mode discrimination. Apodization of the longitudinal gain profile is found to lower the laser threshold by 21% without degrading mode discrimination.

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*Editor*