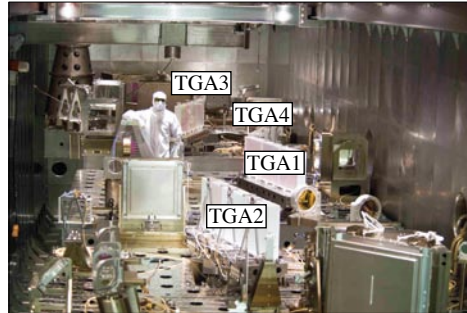
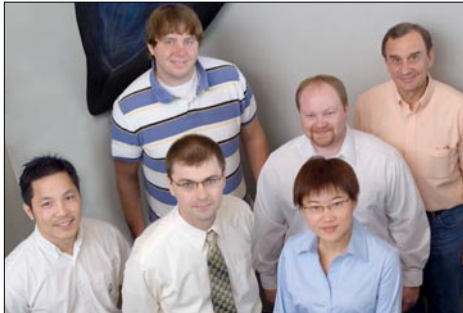


About the Cover:

LLE scientists and engineers have developed an automatic interferometric large-aperture grating tiling technique and realized two tiled-grating compressors for the OMEGA EP High-Energy, Petawatt-Class Laser System. Each compressor consists of four sets of 1.41-m \times 0.43-m tiled-grating assemblies (TGA's), each having three 0.47-m \times 0.43-m grating tiles. This demonstration has overcome the size limitation of the current state-of-the-art diffraction grating. It opens the path for constructing even larger tiled-grating compressors (multiple meters) for high-energy, high-power optical parametric chirped-pulse-amplification systems. Samuel F. B. Morse, OMEGA Facility Director, is seen standing in the OMEGA EP upper compressor inside the grating compressor chamber (GCC). An embedded Fizeau interferometer was used to tile all four TGA's of each compressor. The results of the tiled-grating compressors are reported (see "Development and Demonstration of Large-Aperture Tiled-Grating Compressors for the OMEGA EP Petawatt-Class Laser System," p. 113).



The inside cover photos show members of the Large-Aperture Grating Tiling Development and Realization Team. The four tiled-grating assemblies (TGA's) are illustrated in the photo. Principal Investigator Dr. Jie Qiao, Scientist at LLE (row 1, far right), developed the automatic interferometric tiling and final tiling-optimization techniques for

OMEGA EP tiled-grating compressors. She also developed an optical model of the tiled-grating compressor to predict the effects of grating-tile wavefront, tiling error, and compressor input-beam wavefront on focal-spot performance. This model directed the selection and orientation of all 24 grating tiles. Dr. Qiao ultimately led the team to tile all eight TGA's at vacuum inside the GCC. Project Coordinator David Canning (row 1, middle), together with Adam Kalb (row 2, left), Thanh Nguyen (row 1, left), and other LLE engineers, built, qualified, and deployed eight high-precision TGA's. Troy Walker and William Noonan (row 2, from left to right) worked on the control and software for positioning tiling actuators. The team, with the support of other LLE engineers, delivered two fully aligned, tiled-grating compressors. Both compressors (in operation since February 2008) achieved less than 1-ps pulse width.

This report was prepared as an account of work conducted by the Laboratory for Laser Energetics and sponsored by New York State Energy Research and Development Authority, the University of Rochester, the U.S. Department of Energy, and other agencies. Neither the above named sponsors, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, mark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommenda-

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