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 × 0.43-m tiled-grating assemblies (TGA’s), each having three 0.47-m × 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).

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.

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