OMEGA EP Project: On 13 February 2003, the LLE OMEGA EP laser project passed another important milestone when the United States Congress approved a bill providing $13 million in FY03 to initiate it. The preconceptual design for OMEGA EP was funded by DOE and was completed in May 2002. The OMEGA EP Project was reviewed twice in 2002: (a) the DOE-directed Jason Committee's assessment of the technology of ultrahigh-intensity petawatt (PW) lasers in the context of the national PW effort (July 2002), and (b) the DOE Mission Need Review of the OMEGA EP Project (October 2002). OMEGA EP will initially consist of a new two-beam laser housed in a building adjacent to the existing OMEGA 60-beam facility (see Fig. 1). The new laser will use NIF-like multipass amplifier architecture with a 40-cm aperture. The initial two beams of OMEGA EP will be equipped with the LLE-developed chirped-pulse amplifier (CPA) technology. With an energy capability of 2.6 kJ per beam and pulse lengths ranging from 1 to 100 ps, OMEGA EP will be capable of producing a peak power of 2 to 3 PW (1 PW = 10^{15} W) in a single beam. Focused intensities up to 6×10^{20} W/cm^2 will be available. Ultimately two additional long-pulse (1 to 10 ns) beams are planned to bring the overall system energy capability to ~20 kJ.

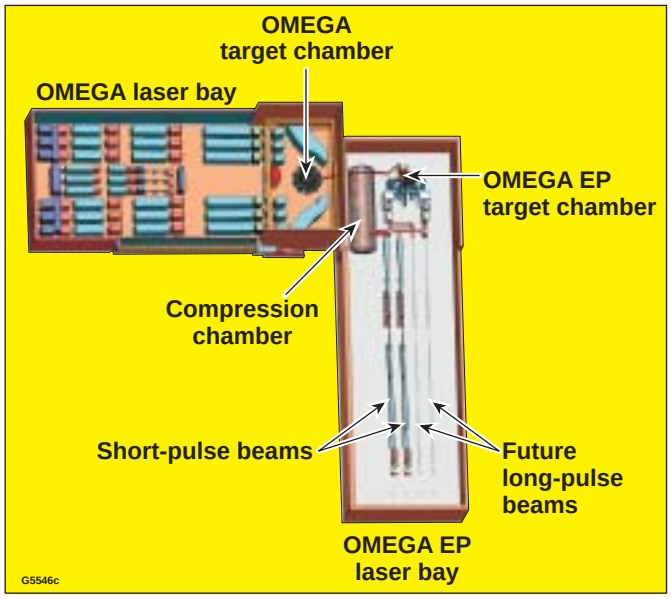

Figure 1. Schematic illustrating the ultimate configuration of OMEGA EP and its relation to the current OMEGA Laser Facility. The two short-pulse OMEGA EP beams will be capable of irradiating targets in either the new OMEGA EP target chamber or the existing OMEGA chamber.

OMEGA EP applications include (see Fig. 2) the development and implementation of high-brightness x-ray backlighting schemes and new diagnostic development, fast-ignition studies, and ultrahigh-energy and ultrahigh-intensity physics experiments. OMEGA EP will provide a unique capability for fast-ignition studies by combining a symmetric compression facility with high-intensity beams to heat the compressed core of imploded capsules. Just as with the current OMEGA system, a large portion of the OMEGA EP shot time will be made available to external users. This will continue LLE's tradition of mutual cooperation with the national laboratories, extend the options for the NLUF Program, and expand LLE's mission of educating future scientists and researchers. OMEGA EP's anticipated shot rate of once every 2 hours enables the system to meet all of these program goals.

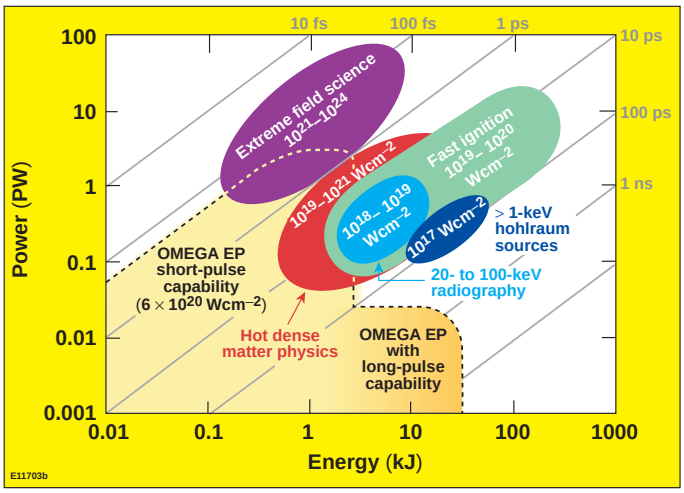

Figure 2. The key laser requirement for high-intensity physics experiments is multibeam, multi-kJ pulses at PW power levels. This graph illustrates the regions of interest for several applications. With additional development, it is expected that OMEGA EP may eventually be capable of generating focused intensities approaching 10^{24} W/cm^2.

OMEGA Operations Summary: During February, OMEGA conducted 122 target shots, including 82 for LLE [20 integrated spherical experiments (ISE), 10 cryogenic-capsule implosions, 27 laser–plasma interaction (LPI) experiments, 12 Stockpile Stewardship Program (SSP) shots, 5 diagnostics development experiments, and 8 shots for power-balance studies]. Eighteen target shots were taken for LLNL campaigns and 22 for the NLUF Program.

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