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Laser Driven Dynamic Hohlraums

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A hohlraum (radiation cavity) is usually thought of as a cavity with rigid, high-Z walls that are opaque to x-rays. Another class of hohlraums is the "dynamic" hohlraums described by Matzen et al. (*Physics of Plasmas* **4**, 1519 [1997]). In the version used on the Sandia Z machine, dynamic hohlraums are generated by a cylindrical array of imploding high-Z wires. A spherical laser driven analog of this has been created using the OMEGA laser at the University of Rochester's Laboratory for Laser Energetics. Forty beams of OMEGA are used to drive a thin capsule filled with Xenon gas (Figure 1). A shock is driven in the Xenon, which radiates so strongly that it collapses to a thin dense layer. This dense Xenon layer is opaque to radiation, and functions as a hohlraum wall. A streaked x-ray radiograph is generated by 10 of the remaining beams (Figure 2). Initially a low level of signal may be seen due to the self-emission from the laser-heated plastic. After the drive beams turn off the radiography beams are turned on, and the remaining plastic and the thin, dense, shock in the Xenon may be seen as dark shadows. The two are separated by a region of low density plastic which has been heated by the radiating shock. This technique has potential applications as an x-ray source for radiography and probing, and as a driver for opacity and implosion experiments.