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Supersonic Heat Wave Propagation in Laser-Produced Underdense Plasmas K.B. FOURNIER, LLNL, Livermore, CA, M. TANABE, H. NISHIMURA, S. FUJIOKA, K. NAGAI, ILE, Osaka University, Japan, A. IWAMAE, Kyoto University, Kyoto, Japan, N. OHNISHI, Tohoku University, Sendai, Japan, F. GIRARD, M. PRIMOUT, B. VILLETTE, D. BABNNEUAU, CEA, Bruyères le Châtel, France, S. MOON, S.B. HANSEN, M. TOBIN, LLNL, Livermore, CA, K. MIMA, ILE, Osaka University, Japan — Intense, multi-keV X-ray sources are required for radiographic applications in laboratory astrophysics and ICF. Low-density targets are favorable for efficient laser-to-X-ray conversion because supersonic energy deposition leads to volumetric heating with low hydrodynamic losses. We report on recent X-ray generation experiments at the GEKKO XII laser. Ti-doped SiO_2 aerogel-filled (3.3 mg/cm^3, 3-6 atom% Ti) Be or CH cylinders were irradiated with nine laser beams with a total of 1 kJ energy in a 2.5 ns square pulse, at 351 nm wavelength. Laser irradiance at the entrance of cylinder was 1.4×10^{14} W/cm^2. The observed heat wave clearly shows two different phases in terms of propagation velocities. The measured heat-front propagation velocity was 1.4×10^{8} cm/s, which is a Mach number of 10 for the given conditions. Electron temperature in the heated target was derived from time-resolved X-ray spectra. By changing observation points, electron temperature profiles of the heat wave along the cylinder axis were obtained at different times.

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