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Spatially-resolved x-ray scattering measurements of a planar blast wave[1] E.J. GAMBOA, University of Michigan, D.S. MONTGOMERY, J.F. BENAGE, K. FALK, Los Alamos National Laboratory, C.C. KURANZ, P.A. KEITER, R.P. DRAKE, University of Michigan — In many laboratory astrophysics experiments, intense laser irradiation creates novel material conditions with large, one-dimensional gradients in the temperature, density, and ionization state. X-ray Thomson scattering is a powerful technique for measuring these plasma parameters. However, the scattered signal is typically measured with little or no spatial resolution, which limits the ability to diagnose inhomogeneous plasmas. We report on the development of a new imaging x-ray Thomson spectrometer (IXTS) for the Omega laser facility. The diffraction of x-rays from a toroidally curved crystal creates high-resolution images that are spatially resolved along a one-dimensional profile while spectrally dispersing the radiation. An experiment is described in which we used the IXTS to measure the spatial temperature profile of a novel system. A low-density carbon foam was irradiated with intensities on the order of 10^{15} W/cm^2, launching a planar blast wave. After a delay of several nanoseconds, x-rays created from irradiation of a nickel foil, scattered at 90° and were recorded by the IXTS. The resulting spatially resolved scattering spectra were analyzed to extract the temperature profile across the blast wave.

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