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Photometric study of single-shot energy-dispersive X-ray diffraction at a laser plasma facility OLIVER HOIDN, GERALD SEIDLER, University of Washington — The low repetition rates and possible shot-to-shot variations in laser-plasma studies place a high value on single-shot diagnostics. For example, white-beam scattering methods based on broadband backlighter x-ray sources are used to determine changes in the structure of laser-shocked crystalline materials by the evolution of coincidences of reciprocal lattice vectors and kinematically-allowed momentum transfers. We demonstrate that white-beam techniques can be extended to strongly-disordered dense plasma and warm dense matter (WDM) systems where reciprocal space is only weakly structured and spectroscopic detection is consequently needed to determine the static structure factor and thus the ion-ion radial distribution function. Specifically, we report a photometric study of energy-dispersive diffraction (ED-XRD) for structural measurement of high energy density systems at large-scale laser facilities such as OMEGA and the National Ignition Facility. We find that structural information can be obtained in single-shot ED-XRD experiments using established backlighter and spectrometer technologies.

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