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Characterization of short-pulse laser-produced bremsstrahlung spectrum using x-ray radiograph images of mm-diameter metal rods[1] HIROSHI SAWADA, University of Nevada, Reno, TYLER DAYKIN, TREVOR HUTCHINSON, BRUNO BAUER, VLADIMIR IVANOV, University of Nevada Reno, FARHAT BEG, University of California San Diego, HUI CHEN, JACKSON WILLIAMS, HARRY MCLEAN, Lawrence Livremore National Laboratory — Determination of an object density via bremsstrahlung x-ray radiography requires understanding of accurate broadband x-ray spectrum. To characterize laser-produced bremsstrahlung and demonstrate bremsstrahlung x-ray radiography of mm-diameter Al rods, we carried out an experiment using a 50TW Leopard laser at the UNR's Nevada Terawatt Facility. Angularly resolved bremsstrahlung was determined by comparing measured x-ray signals from a silver foil with hybrid particle-in-cell simulations. Transmission of the Al rods from the radiograph images is further simulated with a Monte Carlo code. The measured transmission profiles with three different diameters agree with calculations when a simulated x-ray spectrum composed of line emissions and bremsstrahlung is used with a source size of 600 200 μm. Transmission calculations with only 22 keV Ag Kα or an exponential x-ray spectrum do not reproduce the measurement. This work suggests that the accurate modeling of the x-ray source spectrum as well as the photon sensitivity of the detector is critical in transmission calculation to infer the density of an object.

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