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Compact Universal Spectrometer for Secondary X-rays from Laser Wakefield Accelerators ANDREA HANNASCH, University of Texas at Austin, ALEJANDRO LASO GARCIA, Helmholtz-Zentrum Dresden-Rossendorf, MAX LABERGE, RAFAL ZGADZAJ, University of Texas at Austin, JURJEN COUPERUS-CABADAG, ALEX KOEHLER, THOMAS KURZ, TOM COWAN, ULRICH SCHRAMM, ARIE IRMAN, Helmholtz-Zentrum Dresden-Rossendorf, MICHAEL DOWNER, University of Texas at Austin, UNIVERSITY OF TEXAS AT AUSTIN COLLABORATION, HELMHOLZ-ZENTRUM DRESDEN-ROSSENDORF COLLABORATION — We reconstruct spectra of secondary x-rays from a tunable 250-350 MeV laser wakefield electron accelerator from single-shot x-ray depth-dose measurements in a compact (10 x 15 cm), modular x-ray calorimeter made of alternating layers of absorbing materials and imaging plates. X-rays range from few-keV betatron to few-MeV inverse Compton to >100 MeV bremsstrahlung emission and are characterized both individually and in mixtures. Geant4 simulations of energy deposition of single-energy x-rays in the stack generate an energy-vs-depth response matrix for a given stack configuration. An iterative reconstruction algorithm based on analytic models of betatron, inverse Compton and bremsstrahlung photon energy distributions then unfolds x-ray spectra, typically within a minute. We discuss uncertainties, limitations and extensions of both measurement and reconstruction methods.

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