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Tomographic imaging with an intense laser-driven multi-MeV photon source[1] DONALD GAUTIER, JAMES HUNTER, SASIKUMAR PALANIYAPPAN, MICHELLE ESPY, P. K. SINGH, J.C. FERNANDEZ, Los Alamos National Laboratory, R. HOLLINGER, S. WANG, Y. WANG, A. MOREAU, S HUANYU, J. ROCCA, Colorado State University — Intense photon sources with energy >1 MeV are of significant interest for radiography of dense objects in research, industry and defense. One important application is point-projection imaging in tomographic non-destructive evaluation. Irradiation of a high-Z foil with an intense laser drives a large population of relativistic electrons that in turn generate a copious directed emission of high-energy Bremsstrahlung photons. We have reported on such a source of >1 MeV photons driven by the ALEPH laser at Colorado State Univ., featuring a source size well below 0.1 mm. Small source size enables commensurately high image resolution in magnified point-projection radiography, not limited by detector-pixel size. We have exploited the high repetition rate of ALEPH to demonstrate high resolution 2D radiography (10 line-pairs/mm) and a tomographic image (71 views) of a complex object, which shows feasibility for tomography with that photon source. (The softer x-ray part of the spectrum was used for tomography due to the low areal density of the object.) We present the image reconstruction and further characterization of the source, such as the photon spectrum which has been adjusted by varying the laser energy and target thickness.

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