Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

The application of coded apertures for high-energy high-resolution imaging[1] M P SELWOOD, C I D UNDERWOOD, University of York, CHRIS SPINDLOE, Scitech Precision, C D MURPHY, University of York — Laser-plasma x-ray sources have garnered interest from various communities due to their ability to generate high photon-energies from a small source size. The passive imaging of high-energy x-rays and neutrons is also a useful diagnostic in laser-driven fusion as well as laboratory astrophysics experiments which aim to study small samples of transient electron-positron plasmas. Here we demonstrate a coded aperture with scatter and partial attenuation included, which we have dubbed a CASPA. We compare CASPAs to the more common method of pinhole imaging, confirming the well-known throughput increase of coded apertures, and show that the decoding algorithm relaxes the need for a thick substrate. We simulate a 511 keV x-ray source through ray-tracing and Geant4 simulations to show how partial attenuation of the source by the CASPA allows for a superior signal to noise ratio with respect to a standard pinhole system. In addition, we demonstrate successful imaging of high-energy emission at higher resolution than previously attainable. Finally, we note the potential applications in fusion neutron imaging, and outline how this technique could be applied to measurements of implosion asymmetry.

[1]This work was supported by the Engineering and Physical Sciences Research Council grants [EP/L01663X/1] and [EP/R512230/1], Scitech Precision, and the Science and Technology Facilities Council.

Matthew Selwood
University of York

Date submitted: 28 Jun 2020 Electronic form version 1.4