

WS101-1: Laser driven electrons for X-ray backscatter imaging

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High Power Lasers of 10-100's TW capable of achieving relativistic intensities $>10^{18}$ Wcm⁻² are rapidly developing worldwide and such systems are ideal for producing pencil like beams of ~0.05 - 1 GeV electrons. One application which can take full advantage of such electrons is single sided X-ray backscatter imaging[1] – “**X-ray Radar**”.

To deliver penetrating imaging, a narrow electron beam is generated in a suitable gas convertor, sent through the intervening air and strikes the target. As the e-beam passes through the target it generates X-rays and some of these are backscattered[2]. and can escape. Using a time resolved X-ray detector, the depth at which the X-ray were emitted can be determined. If the beam is then scanned across the region of interest a 3D image can be formed

The requirements for both a suitable laser driven e-beam and detector will be explored as well as considering the potential image quality with material depth. Demonstration images obtained using the Gemini laser will be reviewed and the future potential of such systems to deliver high penetration single images will be discussed.

[1] R. M. Deas, L. A. Wilson, D. Rusby, A. Alejo, R. Allott, P. P. Black, S. E. Black, M. Borghesi, C. M. Brenner, J. Bryant, R. J. Clarke, J. C. Collier, B. Edwards, P. Foster, J. Greenhalgh, C. Hernandez-Gomez, S. Kar, D. Lockley, R. M. Moss, Z. Najmudin, R. Pattathil, D. Symes, M. D. Whittle, J. C. Wood, P. McKenna and D. Neely. *Journal of X-ray Science and Technology*, 23, **6**, 791-797, 2015

[2] D. Lockley, R. Deas, R. Moss, L. A. Wilson, D. Rusby, D Neely, *Conference on Detection and Sensing of Mines, Explosive Objects, and Obscured Targets*, SPIE **9823**, 98230V, 2016