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# Laser wakefield accelerators as x-ray sources for biomedical imaging applications

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Laser wakefield acceleration has been established in recent years as a proven method for the generation of electron beams up to the GeV scale in a compact laboratory setting. The oscillation of the electrons inside the plasma accelerator causes the emission of hard x-ray beams with short duration and high photon number. The effective x-ray source size is very small, typically near 1 micron, beneficial for x-ray imaging in two ways - the spatial resolution of point-projection radiography with this source is high, and the x-ray wavefront is spatially coherent over macroscopic distances, facilitating phase-contrast radiography. We have evaluated the suitability of laser-wakefield driven x-ray sources in the context of biomedical and pre-clinical imaging applications. We observe phase-contrast enhancement of small features in human soft-tissue samples, for example micro-calcifications in breast tissue which can be an early indication of cancer. Our source is of sufficient stability that we were also able to perform micro-computed tomography of embryonic murine samples, obtaining excellent resolution and signal-to-noise ratio throughout the 3D reconstruction.

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