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Medical imaging using a laser-wakefield driven x-ray source
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College London — Laser-wakefield accelerators driven by high-intensity laser pulses
are a proven centimetre-scale source of GeV electron beams. One of the proposed
uses for these accelerators is the driving of compact hard x-ray synchrotron light
sources. Such sources have been shown to be bright, have small source size and high
photon energy, and are therefore interesting for imaging applications. By doubling
the focal length at the Astra-Gemini laser facility of the Rutherford Appleton Labo-
ratory, UK, we have significantly improved the average betatron x-ray flux compared
to previous experiments. This fact, coupled to the stability of the radiation source,
facilitated the acquisition of full 3D tomograms of hard bone tissue and soft mouse
neonates, the latter requiring the recording of over 500 successive radiographs. Such
multimodal performance is unprecedented in the betatron field and indicates the
usefulness of these sources in clinical imaging applications, scalable to very high
photon flux without compromising source size or photon energy.

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