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# X-ray induced acoustic computed tomography with laser-wakefield accelerated sources: a simulation study

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An x-ray excitation in a medium can cause localized heating (<mK) and thermoelastic expansion, inducing a detectable ultrasonic emission which potentially enables low-dose, 3D imaging [1]. For effective ultrasonic emission, the dose should be deposited faster than the stress confinement time of the medium, ~ns for many applications. This modality has been studied in medical linear accelerators (LINAC's) [2] and more recently in a synchrotron [3]. LINAC's suffer from long pulses (~μs) and synchrotrons, although successful, are not viable for this application due their size and cost. Laser Wakefield Accelerators (LWFA's), on the other hand, produce femtosecond radiation and are more readily available, making them a candidate to explore XACT. Here, we compare Monte Carlo (GEANT4) simulated dose deposition [4] and acoustic responses from Inverse-Compton scattering radiation, Bremsstrahlung radiation and electrons (all these sources generated by a LWFA) for two applications: (1) imaging of metallic markers in water and (2) imaging of a cortical-trabecular bone configuration embedded in water. Advantages from each radiation source are discussed.

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## Working group

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