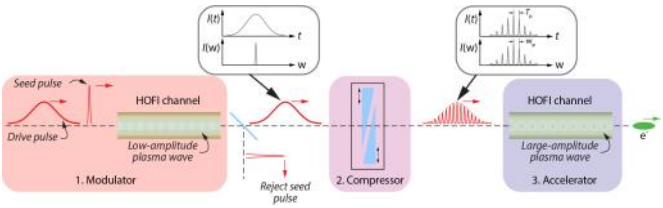
PROJECT NUMBER

18327

A compact, high-repetition rate laser-driven plasma electron accelerator

A compact, high-repetition rate laser-driven plasma electron accelerator.

Applications: Medical imaging, radiotherapy, material inspection, security screening, production of secondary particles (positrons, neutrons, muons etc.)



Features	Benefits
Potential to achieve very high electron beam energies (100 MeV to multi-GeV) in a compact space using “off-the-shelf” industrial lasers	More powerful and efficient system compared to existing technologies
Approach allows the use of new industrial-strength laser technologies (e.g. thin-disk lasers) which can generate laser pulses with high efficiency (> 10%) and at high repetition rates (1 – 10kHz)	Compare favourably to currently-used Ti:sapphire lasers which have very low efficiencies (<0.1%) and (at these pulse energies) are limited to pulse repetition rates below 10Hz
This plasma accelerator could be located in the user’s lab and might even be transportable	The higher repetition rate could offer higher particle and radiation fluxes and be more stable than other laser-driven plasma accelerators
Can generate femtosecond-duration electron bunches synchronized to short-pulse laser	Much less space required compared to conventional RF accelerators; Brings costs of system down

Features	Benefits
Includes a method for converting with high efficiency the long pulse into a train of short (~ 10 fs), equally-spaced (~ 100 fs) pulses	Ideal for driving tunable Compton X-ray sources; Small X-ray source size enables high resolution imaging
	Oxford team has demonstrated experimentally that trains of laser pulses can resonantly drive a GeV-scale plasma accelerator stage; Further experiments underway

Patented and Available for

- Co-development
- Consulting
- Licensing

To find out more, contact enquiries@innovation.ox.ac.uk and quote the project number.

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