INNOVATION & TECHNOLOGY TRANSFER

STEAM

Segmented THz Electron Accelerator and Manipulator

Reference No. P 137

BACKGROUND

Until recently, RF waves have been the conventional choice for powering accelerators due to the high degree of technical maturity of the sources. However, RF-based accelerators require costly infrastructures of large size and power, limiting the availability of this key scientific resource. They also suffer from inherent difficulties in synchronization with lasers, which lead to timing drifts on the 100 fs scale between the electrons, microwave drivers and optical probes, limiting the achievable temporal resolution. Strong motivation thus exists for exploring alternative technologies that are compact, more accessible and adapted for pushing the resolution frontier, especially where lower levels of charge in the few picocoulombs range or lower is sufficient.

SOLUTION

The invention concerns a segmented terahertz electron accelerator and manipulator (STEAM) device capable of performing multiple high-field operations on the six-dimensional phase space of ultrashort electron bunches. This single device, powered by few-micro joule, single-cycle, THz pulses, enables electron acceleration, deflection, streaking, compression and focusing as well as real-time switching between these operation modes. This millimeter sized device can be easily integrated into big accelerator facilities to diagnose or manipulate the beam. In addition, it can be used to realize small and compact electron accelerators with improved cost and energy efficiency compared to conventional radiofrequency devices.

ADVANTAGES

- Perfect synchronization
- Compact and low-cost device
- Ultrahigh fields

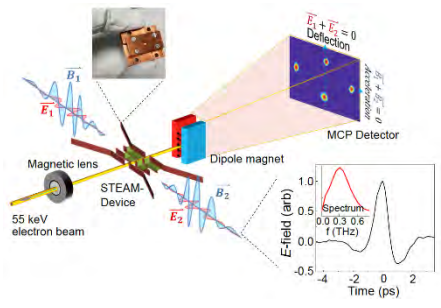

Fig. 1: Principle of the segmented THz electron accelerator.

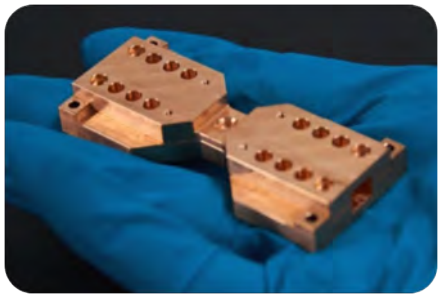

Fig. 2: Segmented THz electron source and manipulator.

APPLICATION FIELDS

- Electron beam diagnostics
- Electron beam manipulation
- Compact accelerators
- Electron sources (in industrial sector)
- X-ray sources (in industrial sector)

PROPERTY RIGHTS

EP 3217771 B1
JP 6887268 B2
US 10304651 B2

POSSIBILITIES OF COOPERATION

- Licensing
- R&D Cooperation

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