CFEL SCIENCE

SEMINAR

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bldg. 99, seminar room II (EG.078)

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Linear electron acceleration in THz waveguides

We report the first experimental demonstration of linear electron acceleration using an optically generated single cycle THz pulse centered at 0.45 THz. 7 keV of acceleration is achieved using 10 μJ THz pulses in a 3 mm interaction length. The THz pulse is produced via optical rectification of a 1.2 mJ, 1 μm laser pulse with a 1 kHz repetition rate. The THz pulse is coupled into a dielectric-loaded circular waveguide with 10 MeV/m on-axis accelerating gradient. A 25 fC input electron bunch is produced with a 60 keV DC photo-emitting cathode.

The achievable accelerating gradient in the THz structures being investigated will scale rapidly by increasing the IR pulse energy (100 mJ - 1 J) and correspondingly the THz pulse. Additionally, with recent advances in the generation of THz pulses via optical rectification, in particular improvements to efficiency and generation of multi-cycle pulses, GeV/m accelerating gradients could be achieved.

An ultra-compact high-gradient THz accelerator would be of interest for a wide variety of applications such as free electron lasers and medical linear accelerators.

Host: Franz X. Kärtner, CFEL-UX Seminar