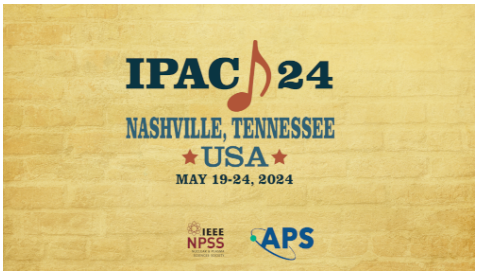

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Development of a novel segmented THz-driven electron source

Monday, 20 May 2024 16:00 (2 hours)

Scaling the RF-accelerator concept to terahertz (THz) frequencies possesses several compelling advantages, including compactness, intrinsic timing between the photoemission and driving field sources, and high field gradients associated with the short THz wavelength and high breakdown threshold promises vastly smaller and cost-efficient accelerators. These benefits, however, come at the cost of smaller dimensions and tighter tolerances which are challenging to reach in practice. Experiments to test and characterize a multi-layered structure easy-to-implement electron source with tunable interaction length powered by 2 × 120 μJ of twin single-cycle THz pulses predicted to produce 100 fC electron bunches with 200 keV energy, < 1 % energy spread, 0.01 - 0.07 mm mrad transverse emittance and a bunch duration of 20 – 40 fs are currently in progress. Besides the gun structure, the performance characteristics of the THz-driven electron source, including the generation of terahertz pulses, UV beam profile, coupling efficiency of the gun structure, electron beam dynamics, etc are discussed in detail. Such THz-based accelerator prototypes are not only promising as injectors for compact THz-based LINACs but also as a source for ultrafast electron diffraction experiments.

Footnotes

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Region represented

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