



Contribution ID: 2428 Contribution code: TUPA072

Type: **Poster Presentation**

Electron-bunch manipulation at 400GHz for compression, de-chirping, acceleration and synchronisation of femtosecond bunches.

Tuesday, 9 May 2023 16:30 (2 hours)

Laser-generated terahertz frequency pulses have been used to manipulate the phase-space of electron beams at the CLARA test facility.

Acceleration gradients of 20 MeV.m^{-1} were achieved in dielectric lined waveguides with narrow-band 400 GHz sources with MW peak powers, and with bunch charge from 2pC to 100pC.

The high-frequency of the acceleration field provided an extremely fast temporal variation of the acceleration gradient, up to $50 \text{ MeV.m}^{-1}.\text{ps}^{-1}$.

With this temporal gradient we have demonstrated the de-chirping of near-compressed 100fs duration electron bunches, obtaining a seven-fold reduction in energy spread. Similarly, we can impose chirp for THz-driven compression. Staged interactions with independent timing (phase) control of two THz pulses interacting with a single electron beam has been undertaken.

THz phase scans and projected energy spread measurement has provided an energy-time phase-space diagnostic for the electron bunch, while examination of the energy gain as a function of phase and interaction location (timing) within the sub-mm waveguide acts as a diagnostic of the acceleration structure.

Progress towards application of these THz acceleration concepts for THz-driven compression and active synchronisation of higher-energy electron beams, for hybrid THz- and laser-plasma acceleration experiments will be discussed.

Funding Agency

Footnotes

I have read and accept the Privacy Policy Statement

Yes

Primary author: JAMISON, Steven (Lancaster University)

Co-authors: LAKE, Daniel (The University of Manchester); GRAHAM, Darren (The University of Manchester); WALSH, David (Science and Technology Facilities Council); SNEDDEN, Edward (Science and Technology Facilities Council); BURT, Graeme (Lancaster University); NIX, Laurence (Cockcroft Institute); HIBBERD, Morgan (The University of Manchester); APPLEBY, Robert (Cockcroft Institute); SIABER, Serhii (Cockcroft Institute); PACEY, Thomas (Science and Technology Facilities Council)

Presenter: JAMISON, Steven (Lancaster University)

Session Classification: Tuesday Poster Session

Track Classification: MC3: Novel Particle Sources and Acceleration Techniques: MC3.A16: Advanced Concepts