Contribution ID: **1184** Contribution code: **THODA3** Type: **Contributed Oral Presentation**

Acceleration of electrons from a linear accelerator by a laser driven plasma wave at CLARA

Thursday 11 May 2023 10:10 (20 minutes)

Plasma based accelerators have achieved beams with multi-GeV energy, percent-level energy spread, micron emittance and stability over a full day however it remains a challenge to generate beams with all these properties simultaneously. External injection of a beam from a RF linac into a plasma-based accelerator holds the prospect of improving the beams from plasma accelerators by combining their high gradient with the high quality of RF accelerators. If the beam is matched to the plasma, then the initial beam emittance and energy spread can be preserved. This technique can also be used to investigate the staging of multiple plasma accelerator stages in a controlled manner by providing a stable beam to the plasma target being tested.
We present results of an experiment performed at the CLARA accelerator in the UK investigating the external injection of the 35 MeV, 20 pC electron beam containing from the linac into a laser driven plasma wave with accelerating gradient ˜100 MV/m. The beam length was larger than the plasma wavelength resulting in electrons experiencing both positive and negative accelerating fields across several plasma buckets which broadens the energy spectrum rather than a pure energy gain. This proof-of-principle experiment is part of preparatory work aiming towards acceleration of electron beams with near perfect beam quality preservation. Simulations are also presented for beam parameters after a scheduled upgrade to CLARRA which inform future experiments.

Funding Agency

Footnotes

I have read and accept the Privacy Policy Statement

Yes

Author: Dr REID, Lewis (Cockcroft Institute)

Co-authors: MORRIS, Alex (Cockcroft Institute); KNETSCH, Alexander (Laboratoire d'Optique Appliquée); HIDDING, Bernhard (Cockcroft Institute); WALSH, David (Science and Technology Facilities Council); MANAHAN, Grace (University of Strathclyde); JONES, Harry (Cockcroft Institute); CHRISTIE, Jonathan (The University of Liverpool); CORNER, Laura (Cockcroft Institute); BOULTON, Lewis (Cockcroft Institute); RADFORD, Miles (The University of Liverpool); PACEY, Thomas (Science and Technology Facilities Council); OKELL, William (Science and Technology Facilities Council)

Presenter: Dr REID, Lewis (Cockcroft Institute)

Session Classification: MC03.3 - Novel Particle Sources and Acceleration Techniques (Contributed)

Track Classification: MC3: Novel Particle Sources and Acceleration Techniques: MC3.A15: New Acceleration Techniques