Contribution ID: **50** Type: **Poster (student)**

# Realization of plasma photocathode injection in a compact plasma accelerator powered by laser-accelerated electron beams

*Monday, 14 April 2025 17:10 (1h 30m)*

Ultrashort high-peak current electron beams generated from laser wakefield acceleration (LWFA) are capable to drive high accelerating gradient plasma wakefield accelerators (PWFAs) operating in high plasma density regime. Implementation of advanced cold-injection schemes in this hybrid platform promises the generation of high brightness electron beams with unprecedented low emittance and energy spread.
Here we report on the realization of plasma photocathode injection using 90 degree geometry in such a compact plasma accelerator consisting of a mixture of hydrogen and helium gas. Electrons from the highest ionization level of helium are released into the wakefield by a carefully tuned low intensity laser pulse. Scanning of the laser arrival time shows that the injection only occurs within the first cavity, characterizing this injection scheme.
In this proof-of-concept experiment, witness beams with an absolute energy bandwidth as low as 2 MeV (full-width at half-maximum) peaked at 140 MeV can be generated at divergence of only 0.4 mrad (root-mean-square). Further post-acceleration of such a witness beam, i.e elongating the PWFA stage close to the depletion distance of the driver in future work, would result to relative energy spread in per mille level required for beam-quality-demanding light source applications.

**Primary authors:** Mr NUTTER, Alastair (University of Strathclyde, Glasgow, UK); UFER, Patrick (Helmholtz-Zentrum Dresden-Rossendorf)

**Presenter:** UFER, Patrick (Helmholtz-Zentrum Dresden-Rossendorf)

**Session Classification:** Poster Session

**Track Classification:** Electron acceleration