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Progress and perspectives of the "E310: Trojan Horse-II" program at SLAC FACET-II

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Plasma photocathodes utilize a comparatively low-power laser pulse to release and inject electrons directly inside an electron-driven plasma wakefield via selective ionization of a dopant gas or ion species. This injection process is therefore largely decoupled from wake formation and driver evolution dynamics. Also known as "Trojan Horse"injectors, plasma photocathodes promise a pathway towards controlled production of ultra-high brightness electron beams with emittances on the order of ~10 nm rad and kA peak-currents [1].
We report on recent progress and perspectives of the "E310: Trojan Horse-II"experimental program at the Facility for Advanced Accelerator Experimental Tests II (FACET-II) at SLAC National Accelerator Laboratory, which utilizes a 10 GeV electron driver and a mixture of hydrogen and helium for wake formation and injection, respectively.
We will provide an overview of principal experimental design aspects and discuss further advancements of the experimental setup towards implementing plasma photocathodes under various injection geometries. Experimental results from first ionization tests will be presented on a dedicated poster.

[1] A. F. Habib et al. "Plasma Photocathodes". Ann. Phys. 2023

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