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## Demonstration of Trojan horse injection in a hybrid LWFA-driven PWFA

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In a hybrid LWFA-driven PWFA (LPWFA) electron beams from a laser wakefield acceleration (LWFA) stage are utilized to drive a plasma wave in a subsequent plasma wakefield acceleration (PWFA) stage for acceleration of witness electron bunches to high energies. This concept allows for the exploration of PWFA-physics in a compact setup and harnessing the advantages of both plasma acceleration schemes in order to generate high-quality electron beams. Here we present results of Trojan horse injection in this hybrid plasma acceleration configuration. The DRACO laser is focused onto a gas target (LWFA stage), creating a plasma wakefield to accelerate a high peak current electron bunch. While such a beam is propagating in the second gas jet (PWFA stage), consisting of a mixture of high and low ionization threshold gas, an auxiliary low energy laser pulse intercepts the generated wakefield perpendicularly to release electrons from the highest ionization level in the first cavity. The generated witness beams show improved beam quality, such as lower energy spread compared to the drive electron beam. The realization of Trojan horse injection in LPWFA is a further step towards applications based on high brightness electron beams such as free electron lasers.

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