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First demonstration of hybrid plasma acceleration

Novel plasma accelerators can either be powered by a TW-class laser system (LWFA) or by a nC-class particle beam (PWFA).

Although the LWFA-technique is very well established, it still struggles to produce high-quality electron beams which are required to drive secondary light sources efficiently.

Accelerators based on PWFA may solve this issue, but those are still restricted to large facilities (e.g. FACET or DESY) since the PWFA concept requires a very strong (kA-peak-currents) drive beam.

Only recently even higher peak-current drive beams were shown by LWFA accelerators.

Therefore, we established an experimental setup to investigate the feasibility of a so-called hybrid “LWFA + PWFA” accelerator that might be able to produce high quality beams in the future.

Here, we present the first demonstration of accelerating an electron beam in lwfa-pwfa hybrid accelerator.

It is found that the energy gain of the so-called “witness” beam is significantly enhanced in the case of a pre-ionized PWFA stage.

This promising result shows the experimental feasibility of the proposed hybrid concept and opens new possibilities for the generation of high brightness electron beams in the future.

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