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Downramp-assisted underdense photocathode electron bunch generation in plasma wakefield accelerators

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The underdense photocathode “Trojan Horse” plasma wakefield acceleration is a promising technique for the generation of high-brightness and low-emittance witness bunches.

It is shown that requirements on the driver electron beam can be substantially decreased by performing the witness beam generation on a soft density downramp, which facilitates trapping. As a consequence the underdense photocathode technique is applicable by a larger number of accelerator facilities and dark current is effectively suppressed.

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