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Controlled Injection in a Channel-Guided Laser Plasma Accelerator via All-Optical Plasma Density Tailoring

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We propose a novel scheme for controlling the injection of a high-quality electron bunch into a channel-guided laser plasma accelerator. The all-optical plasma density tailoring technique allows for the generation of a tunable controlled injection structure natively within a plasma waveguide, a key requirement for efficient single-stage acceleration of multi-GeV beams of high quality. We describe a simple optical setup to form the structure and present proof-of-concept simulations showing the acceleration of a GeV electron beam with 18 pC of charge and less than 1 % energy spread using 1 J of drive laser energy.

Working group

WG1 : Laser-driven plasma wakefield acceleration

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