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Effect of phase and frequency variation on laser driven wakefield acceleration¹ V.B. PATHAK, J. VIERIRA, R.A. FONSECA, L.O. SILVA, GoLP/Instituto de Plasmas e Fusão Nuclear-Laboratório Associado, Instituto Superior Técnico, Portugal, W.B. MORI, University of California, Los Angeles USA — Combining several laser beams can be one of the solutions to achieve ultra high intensities in future state of the art laser facilities (e.g. ELI and HiPER). However, slight mismatches in the laser parameters (e.g. frequency, phase, pulse width, etc.) of these beams can result into a laser with enhanced bandwidth and pulse duration, and asymmetric transverse and longitudinal profiles. The study of laser wakefield acceleration (LWFA) driven by such lasers becomes crucial for future applications. In this work we consider the effect of phase, frequency and pulse duration mismatch on LWFA. We find that the injection longitudinal position, and self-injected charge can be tuned by the longitudinal chirp of the laser pulse. Moreover, the transverse injection position may be controlled by a suitable chirp of the laser wave number on the transverse direction, and may lead to off-axis injection. Our results are supported by PIC simulations using the Osiris 2.0 framework, and with analytical estimates.

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