

Influence of realistic parameters on state-of-the-art LWFA experiments

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We examine the influence of non-ideal plasma-density and non-Gaussian transverse laser-intensity profiles in the laser wakefield accelerator analytically and numerically. We find that the characteristic amplitude and scale length of longitudinal density fluctuations impacts on the final energies achieved by electron bunches. Conditions that minimize the role of the longitudinal plasma density fluctuations are found. The influence of higher order Laguerre-Gaussian laser pulses is also investigated. We find that higher order laser modes typically lead to lower energy gains. Certain combinations of higher order modes may, however, lead to higher electron energy gains.

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