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BEAM QUALITY PRESERVATION IN A LASER-PLASMA ACCELERATOR WITH EXTERNAL INJECTION IN THE CONTEXT OF EuPRAXIA

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Over the past decades the production of multi-GeV electron beams from laser-plasma-based accelerators has been successfully demonstrated. However, the overall quality of electron beams produced in plasma accelerators is not yet good enough for the realization of applications such as compact X-ray sources for material processing or medical imaging. To satisfy the requirements of these user-applications, produced electron beams should have sufficient stability, reproducibility and quality. To avoid degradation of the relative energy spread during acceleration, the electron beam should be injected at the proper phase and its longitudinal size should be much shorter than the plasma wave length. Tailoring the longitudinal plasma density profile has been used to minimize emittance growth. We present studies on minimization of the beam quality degradation during acceleration to 1 GeV in a laser plasma accelerator with external injection from an RF linac, using simulations with the particle-in-cell code OSIRIS [1].

[1] R. Fonseca et al., Lect. Notes Comput. Sci. 2331, 342 (2002); R. Fonseca et al., Plasma Phys. Control. Fusion 50, 124034 (2008).

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