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Design of a laser wakefield relativistic electron source

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The generation of electron sources by high gradient laser wakefield acceleration (LWFA) has already demonstrated its feasibility. This acceleration technique is on the way to be implemented for practical uses by well-defined user communities. However, obtaining the required outstanding high-quality beams is a difficult challenge. Several key parameters, such as the laser distribution (including intensity, waist, and shape) and plasma profile (including max density, length, and composition), must be selected carefully to control the final electron beam properties and generate a high-quality electron beam (200 MeV, > 100 pC, 1μm, 1%) via a localized ionization injection scheme. We will present results of particle-in-cell simulations carried out to investigate the role of the plasma and laser characteristics in reducing the energy spread and the emittance while increasing the electron beam charge and energy. We search to have appropriate Twiss parameters to enable beam transport to users, as well as determine the best configuration for the EARLI project, a LWFA expected as an electron injector for the AWAKE experiment.

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Footnotes

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Yes

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