



Recent progresses on high quality and staged laser wakefield acceleration at SJTU

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Recent studies on laser wakefield acceleration at SJTU will be introduced. Especially the effort on improving the electron beam quality and maximum energy will be discussed in detail.

Two kinds of high quality electron injection schemes, including ionization injection and wave-wave collider injection, are both theoretically and experimentally studied. The former scheme makes electron beam with sub-percent energy spread possible, the latter not only improves the beam quality but also provides a new kind of wake diagnostic method.

For higher energy LWFA acceleration, a compact and efficient staged LWFA scheme is proposed, which realizes simultaneous coupling of the electron beam and the laser pulse to the second stage with plasma channels. A special designed bending channel is used to guide a fresh laser into a following straight channel, while the electron beam always propagates in the straight channel.

Benefiting from the shorter coupling distance and continuous guiding of the electron beam in plasma, its transverse dispersion is suppressed. With moderate laser parameters, our particle-in-cell simulations demonstrate that the electron beam from the previous acceleration stage can be efficiently injected into the following stage for further acceleration, where the re-injection ratio, stability, and beam quality can be kept at a high level.

References

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