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Study of Ionization effects on Laser accelerated electron beam with laser-ablated metallic plasma targets

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Laser wakefield acceleration (LWFA) using laser-ablated metallic plasma targets has been developed for high-vacuum and high-repetition rate operations. The metallic plasma density (called the pre-plasma) generated by laser-ablation is increased via the optical ionization process due to intense fs laser pulse (called the main laser). The optical guiding of main laser in the plasma is influenced by the effects of the self-focusing, the self-compression, the optical divergence, and the ionization diffraction. Comparing with the case of helium plasma, the ionization injection occurred slightly earlier and the ionization diffraction is dominated so quickly. The strong diffraction allows the condition where the accelerating field become almost zero in a short time before the electrons may experience the dephasing field, keeping the energy spread of accelerated beam narrow.
We present and discuss the simulation results for high quality electron beam improved by the ionization effect: one is a structured metal target using two different metals to improve the beam charge and the dephasing-free condition for lower energy spread in a metallic plasma.
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Working group

WG1 : Laser-driven plasma wakefield acceleration

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