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Effects of pulse evolution on ionization injection in meter-scale multi-GeV laser wakefield acceleration

The generation of meter-scale, low density (≤10^17 cm^(-3)) plasma waveguides [1,2] in long supersonic gas jets has enabled the consistent production of multi-GeV electron beams in laser wakefield acceleration (LWFA), using drive pulses of just a few hundred TW [3,4,5]. The customizability of these waveguides has opened a wide parameter space for LWFA performance since the electron injection and acceleration process depends on properties of the drive pulse and waveguide structure. Our group recently developed a model of beam evolution in a plasma waveguide and its effects on enhancing and suppressing ionization injection [5]. In this poster, we present experimental results demonstrating the effects of waveguide properties on ionization injection and the characteristics of resulting electron beams from 30cm self-waveguided LWFAs. We further show that, under optimum conditions, stable production of >100 pC, multi-GeV beams can be achieved.

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Working group

WG1 : Laser-driven plasma wakefield acceleration

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