DPP13-2013-001273

Abstract for an Invited Paper
for the DPP13 Meeting of
the American Physical Society

Wakefield excitation and electron injection using multiple laser pulses in plasmas[1]

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Efficient excitation of large amplitude, relativistic plasma waves and the production of high quality (low energy spread and low emittance) electron bunches is of fundamental importance to plasma-based accelerators and their applications. In this talk, several methods for wakefield excitation and laser-triggered injection of high quality electron bunches that rely on one or more laser pulses will be discussed. Novel techniques for exciting and controlling the laser-induced wakefields using multiple, multi-color pulses and pulse trains will be presented. In addition, an electron injection method that relies on two-color ionization injection will be discussed. Here a low frequency, high normalized vector potential pulse is used to drive the wakefield, and a trailing high frequency, low normalized vector potential (but high electric field) pulse is used for ionization injection. This injection mechanism is compared to self-trapping in the nonlinear bubble regime, in which the trapping threshold dependence on laser intensity and wake phase velocity has been numerically explored.

[1]Supported by the U.S. Department of Energy under Contract No. DEAC02-05CH11231.