

Abstract Submitted
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Positron driven plasma wakefields¹ S. PINKERTON, Y. SHI, USC, C. HUANG, LANL, W. AN, W.B. MORI, UCLA, P. MUGGLI, USC — The LHC is producing high-energy, high-charge proton bunches (1e11 protons at 1-7 TeV each) that could be used to accelerate “witness” electron bunches to TeV range energies via a plasma wakefield accelerator (PWFA). Simulations [1] suggest that a proton “drive” bunch is able to excite large wakefields if the bunch size is on the order of 100 μm ; however, the LHC parameters are currently on the 1 cm scale. SLAC’S FACET is able to supply positron bunches with the ideal parameters for driving a PWFA. Although at lower energy (2e10 positrons at 23 GeV each), initial simulations in QuickPIC show that the physics of a positron drive bunch is very similar to that of a proton drive bunch. Differences in the physics arise from the mass difference: slower dephasing but faster transverse bunch evolution. Other considerations include driver head erosion and purity of the wakefield ion column. The physics of positive drivers for PWFA and the viability of this scheme for future high-energy colliders will be investigated at SLAC’S FACET.

[1] Caldwell, et al. Nature Physics 5, 363 (2009).

[2] C.H. Huang, et al., J. Comp. Phys., 217(2), 658, (2006).

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