

Abstract Submitted  
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**A two-stage –injector-accelerator– plasma wakefield accelerator at FACET**<sup>1</sup> NAVID VAFAEI-NAJAFABADI, C.E. CLAYTON, K.A. MARSH, W. AN, W.B. MORI, C. JOSHI, UCLA, W. LU, Tsinghua University, UCLA, E. ADLI, University of Oslo, SLAC National Accelerator Laboratory, S. CORDE, J. FREDERICO, S.Z. GREEN, M. LITOS, S. GESSNER, D. WALZ, C.I. CLARKE, M.J. HOGAN, V. YAKIMENKO, SLAC National Accelerator Laboratory, P. MUGGLI, Max Planck Institute for Physics — Ionization injection is important for a beam-driven plasma-wakefield-accelerator because it can be used to embed electrons within a highly-relativistic wake. Furthermore, the placement of an acceleration stage following such an injector opens the possibility of controlling the charge, emittance, and energy spread of the beam. Such two-stage accelerator experiments have been carried out at the FACET facility at SLAC. The ionization injection stage is formed by a 10 cm density up-ramp of Li vapor, which overlaps with a density down-ramp of He. The He atoms provide a source of electrons for injection into the wake that is created by the 3nC, 20 GeV FACET electron beam. The injected electrons are then accelerated by the wakefield generated in either a 30 cm,  $2.5 \times 10^{17} \text{ cm}^{-3}$  or a 130 cm,  $8 \times 10^{16} \text{ cm}^{-3}$  Li plasma. Narrow-divergence electron bunches with energies as high as 30 GeV attributable to He electrons are observed.

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Navid Vafaei-Najafabadi  
UCLA

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