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Injection and trapping of electrons into a LWFA via tunneling ionization A. PAK, K.A. MARSH, S.F. MARTINS, J.L. MARTINS, N. LEMOS, W. LU, C.E. CLAYTON, L.O. SILVA, W.B. MORI, C. JOSHI, DEPARTMENT OF ELECTRICAL ENGINEERING, UCLA, LOS ANGELES, CA 90095 USA TEAM, GOLP/INSTITUTO DE PLASMAS E FUSAO NUCLEAR, IST, LISBON PORTUGAL TEAM, DEPARTMENT OF PHYSICS AND ASTRONOMY, UCLA, LOS ANGELES, CA. 90095 TEAM — Results from experiments, PIC simulations and theory are presented on the injection of electrons into a laser wakefield accelerator via tunneling ionization. In this work, a Ti:Sapphire laser was focused to an a_o of 1.5-2.5 onto a gas jet target comprised of mixture of 90:10% He to N_2. There is a large step in the ionization potential (IP) between the L-and K-shell electrons of nitrogen. The step in IP can be matched to the laser intensity profile and plasma density, such that electrons from the K-shell of nitrogen that are created near the peak field of the laser, are injected into the electric field of the fully formed wake created from the He and L-shell electrons of N_2. It is shown that the injection of electrons via ionization reduces the wake amplitude and thus the laser power required to trap and accelerate electrons. The way in which ionization injection effects the electron energy gain, divergence and charge will be discussed. Work supported by DOE grants DE-FG02-92ER40727, DE-FC02-07ER41500, DE-FG52-09NA29552 NSF grants PHY-0936266, PHY-0904039.

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