Abstract Submitted
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Ionization-injected electron acceleration with sub-terawatt laser pulses[1] LINUS FEDER, ANDY GOERS, GEORGE HINE, BO MIAO, FATHOLAH SALEHI, DANIEL WOODBURY, HOWARD MILCHBERG, Univ of Maryland-College Park — The vast majority of laser wakefield acceleration (LWFA) experiments use drive lasers with peak powers >10 TW and repetition rates from 10 Hz to less than once an hour. However, it was recently demonstrated that by using a thin, high density gas target, LWFA can be driven by laser pulses well below a TW and with high repetition rates [1,2].We present experiments and particle-in-cell (PIC) simulations of the effect of doping the high density gas jet with higher Z molecules (here nitrogen). Our earlier experiments with low-Z gas relied on self-injection of electrons into the accelerating wake through wave-breaking [1]. In ionization injection, the relativistically self-focused laser pulse ionizes the inner shell of the dopant inside the plasma wake [3]. High energy electrons are then trapped by the wakefield in the earliest potential buckets, which overlap with the laser pulse. PIC simulations show acceleration of these electrons by LWFA and directly by the laser pulse, with the direct contribution significantly increasing the electron energy beyond the LWFA contribution alone. Additionally, ionization injection can be controlled to prevent dephasing of the electron beam, resulting in a narrower energy spectrum and lower spatial divergence. 1. A.J. Goers et al., Phys. Rev. Lett. **115**, 194802 (2015) 2. F. Salehi et al., submitted for publication 3. A. Pak, et al., , Phys. Rev. Lett. 104, 025003 (2010).

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