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Enhanced Self-Injection by Optical Field Ionization Heating in a Laser Wakefield Accelerator[1] YONG MA, DANIEL SEIPT, AMINA HUSSEIN, University of Michigan -Ann Arbor, SAHEL HAKIMI, NICHOLAS BEIER, University of California, Irvine, STEPHANIE HANSEN, Sandia National Laboratories, JESUS HINOJOSA, ANATOLY MAKSIMCHUK, JOHN NEES, KARL KRUSHELNICK, ALEC THOMAS, University of Michigan -Ann Arbor, FRANKLIN DOLLAR, University of California, Irvine — Laser-wakefield acceleration (LWFA) experiments performed using the Hercules laser show a decrease of the self-injection threshold by using circularly polarized (CP) laser pulses compared with linearly polarized (LP) pulses, similar to the threshold lowering in LWFA driven in a warm plasma. In addition to the lower injection threshold, a significantly higher electron beam charge was observed for CP compared to LP over a wide range of parameters. Theoretical analyses and quasi-3D Particle-in-Cell simulations agree with the observed experimental findings and indicate a modified injection path for CP laser pulses, which enables electrons from a much broader range of parameters to be injected.

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