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Injection of externally produced kinetic electrons into a self-guided laser wakefield accelerator BRADLEY POLLOCK, JOSEPH RALPH, FELICIE ALBERT, Lawrence Livermore National Laboratory, JESSICA SHAW, CHRISTOPHER CLAYTON, KEN MARSH, CHAN JOSHI, WARREN MORI, University of California, Los Angeles, LEIGH KESLER, Massachusetts Institute of Technology, SARAH MILLS, University of Arkansas, BRIAN SEVERSON, The United States Military Academy, ALEXANDRA RIGBY, Oxford University, SIEGFRIED GLENZER, Lawrence Livermore National Laboratory — A two-stage laser wakefield accelerator is being developed at the Lawrence Livermore National Laboratory using the Callisto laser system. The first stage is a high density ($\sim 10^{19}$ cm^{-3}), 5 mm He gas jet plasma which is driven by 30 TW of 800 nm laser light focused to an $a_0 \sim 2$. The <100 MeV electrons produced in this stage are deflected by a 0.5 T dipole magnet onto the axis of the second stage, which is a low density ($\sim 10^{18}$ cm^{-3}), 15 mm He gas cell driven by 200 TW of 800 nm light also focused to an $a_0 \sim 2$; no additional electrons are trapped in this stage. Electrons injected into the second stage can then be further accelerated to higher energy without increasing the energy spread. Measurements of the transmitted laser profile and spectrum from the second stage indicate that the laser pulse is self-guided throughout the gas cell and that a strong wake is driven. These results compare well with particle-in-cell (PIC) simulations performed with the code OSIRIS. This work was performed under the auspices of the United States Department of Energy by the Lawrence Livermore National Laboratory under contract No. DE-AC52-07NA-27344.

Bradley Pollock
Lawrence Livermore National Laboratory

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