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Energy Gain Greater Than 1GeV in a Plasma Wakefield Accelerator MARK HOGAN, Stanford Linear Accelerator Center, CHRISTOPHER BARNES, FRANZ-JOSEF DECKER, PAUL EMMA, RICHARD IVERSON, PATRICK KREJCIK, CAOLIONN O'CONNELL, ROBERT SIEMANN, DIETER WALZ, Stanford Linear Accelerator Center, CHRIS CLAYTON, CHENGKUN HUANG, DEVON JOHNSON, CHAN JOSHI, WEI LU, KENNETH MARSH, WARREN MORI, University of California at Los Angeles, SUZHI DENG, TOM KATSOULEAS, PATRIC MUGGLI, ERDEM OZ, University of Southern California — In the plasma wakefield accelerator, a short relativistic electron bunch drives a large amplitude wave or wake. In experiment E-164X, we use the 28.5 GeV, ultrashort (>80femtosecond), high peak current (<30kiloampere) bunch now available in the Final Focus Test Beam Facility. The head of the bunch field ionizes a lithium vapor and excites the wake while the tail samples the accelerating field. The latter is accomplished by setting the plasma density to match the plasma wavelength to the bunch length. Preliminary analysis shows that gradients in excess of 30 GeV/m are excited over a plasma length of approximately 10cm, leading to energy gains on the order of 3GeV or about an order of magnitude greater than gains reported to date and three orders of magnitude larger than that in the three-kilometer long Stanford Linear Accelerator that produces the incoming beam. The current status of the experiment as well as future plans will be discussed.

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