Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

MeV electron acceleration by sub-terawatt laser pulses in near critical density plasmas[1] ANDY GOERS, GEORGE HINE, LINUS FEDER, BO MIAO, FATHOLAH SALEHI, HOWARD MILCHBERG, University of Maryland, College Park — We demonstrate laser-plasma acceleration of high charge electron beams to the 10 MeV scale using ultrashort laser pulses with as little energy as 10 mJ. This result is made possible by an extremely dense and thin hydrogen gas jet where even sub-terawatt laser pulses are well above the critical power for relativistic self-focusing, and the 10 mJ pulses can drive a self-modulated wakefield accelerator. Total charge up to 0.5 nC is measured for energies >1 MeV. Acceleration is correlated to the presence of an intense, coherent, broadband light flash, associated with wavebreaking, which can radiate more than 3% of the laser energy in a sub-femtosecond bandwidth consistent with half-cycle optical emission. Our results enable truly portable applications of laser-driven acceleration, such as low dose radiography, ultrafast probing of matter, and isotope production.

[1]This work supported by DTRA and the US Department of Energy.

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Date submitted: 24 Jul 2015 Electronic form version 1.4