Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Application of a laser-heater for advanced guiding of PetaWatt laser pulses in capillary plasmas[1] ANTHONY GONSALVES, JOOST DANIELS, CARLO BENEDETTI, HANN-SHIN MAO, KEI NAKAMURA, CHRISTOPHER PIERONEK, CARL SCHROEDER, SVEN STEINKE, WIM LEEMANS, BELLA Center, Lawrence Berkeley National Laboratory — Laser-plasma accelerators (LPAs) form an attractive scheme for developing compact accelerators, due to their high acceleration gradients. In the push to higher electron beam energies, one of the main challenges is to increase the dephasing length L_d over which energy can be transferred to the electrons, while keeping the laser confined to provide the required accelerating fields. Currently, the highest energy electron beams from an LPA have been achieved by using pre-formed density channels from capillary discharge plasmas.[1] Confinement of laser pulses with higher order mode content required higher density than optimum for reaching higher energies. Improved laser confinement at lower density, extending L_d, has been proposed through use of a ns-scale heater pulse before the ultrashort, high-powered pulse arrives.[2] Here, we present experimental results of applying this technique to channels of up to 20 cm in length to enhance guiding of PetaWatt pulses from the BELLA laser, including electron and laser properties from the accelerator.

[1] W.P. Leemans *et al.*, Physical Review Letters **113**, 245002 (2014).
[1] N.A. Bobrova *et al.*, Physics of Plasmas **20**, 020703 (2013)

[1]This work was supported by the Director, Office of Science, Office of High Energy Physics, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

Joost Daniels
BELLA Center, Lawrence Berkeley National Laboratory

Date submitted: 14 Jul 2017 Electronic form version 1.4