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Laser-heated capillary discharge waveguides as tunable structures for laser-plasma acceleration[1] C.V. PIERONEK, Lawrence Berkeley National Laboratory, University of California, Berkeley, A.J. GONSALVES, K. NAKAMURA, C. BENEDETTI, J.H. BIN, S.S. BULANOV, J. VAN TILBORG, C.G.R. GEDDES, C.B. SCHROEDER, J. DANIELS, C.S. TOTH, L. OBST-HUEBL, M. TURNER, Lawrence Berkeley National Laboratory, R.G.W. VAN DEN BERG, University of Eindhoven, G. BAGDASOROV, N. BOBROVA, V. GASILOV, Keldysh Institute of Applied Mathematics RAS, G. KORN, Institute of Physics ASCR, P. SASOROV, Keldysh Institute of Applied Mathematics RAS, W.P. LEEMANS[2], E. ESAREY, Lawrence Berkeley National Laboratory — Laser heated capillary discharge waveguides have been used to guide PW-scale laser pulses over many diffraction lengths at plasma densities suitable for multi-GeV laser plasma acceleration. These structures recently enabled the acceleration of electrons to 7.8 GeV in a single stage with 850 TW of laser power. Experiments and simulations elucidating the physical processes by which waveguide formation occurs, as well as the effect of laser and plasma parameters on waveguide properties, are presented. The implications of these results for production of high-performance acceleration structures is discussed. Finally, methods for production of quasi-monoenergetic electron beams at the multi-GeV level are discussed.

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[2]Now at DESY

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