Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Electron Acceleration in Guiding and Non-Guiding Structures
C. KAMPERIDIS, S.P.D. MANGLES, S. KNEIP, K. KRUSHELNICK, Z. NAJMUDIN, Imperial College London, UK, T.P. ROWLANDS-REES, A.J. GONZALVES, S.M. HOOKER, University of Oxford, UK, E. BRUNETTI, J. GALLACHER, D.A. JAROSZYNKSI, University of Strathclyde, UK, C.D.M. MURPHY, P.A. NORREYS, Rutherford Appleton Laboratory, UK, F. BUDDE, Friedrich-Schiller Jena, Germany — We make a direct comparison of recent experimental results on laser wakefield acceleration, when the electrons are produced and accelerated in optically guiding and non-guiding plasma structures. In these experiments, ∼10TW laser pulses were guided through plasma channels of up to 50mm long, created either by external means (capillary channel formation) or by relativistic self-focusing of the laser pulse itself. Quasimonoenergetic electron beams were generated with energies up to 200MeV and energy spreads of a few %. High resolution, large scale 2D PIC simulations suggest that although the laser pulse evolution and injection process is similar, the final acceleration results differ from one case to the other, depending on background plasma density and whether or not a preformed guiding channel is used.

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Date submitted: 19 Jul 2007 Electronic form version 1.4