Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Linear to non linear analysis for positron acceleration in plasma hollow channel wakefields LIGIA DIANA AMORIM, GoLP/IST - Universidade de Lisboa, Portugal, WEIMING AN, WARREN B. MORI, Department of Physics and Astronomy, UCLA, JORGE VIEIRA, GoLP/IST - Universidade de Lisboa, Portugal — Plasma wakefield accelerators are promising candidates for future generation compact accelerators. The standard regime of operation, non-linear or blowout regime, is reached when a particle bunch space charge or laser pulse ponderomotive force radially expels plasma electrons forming a bucket of ions that defocus positron bunches, thus preventing their acceleration. To avoid defocusing, hollow plasma channels have been considered [L. Yi et al., Scientific Reports 4, 4171 (2014)]. The corresponding wakefields have been examined in the linear [C. B. Schroeder et al., PoP 20, 123115 (2013)] and non-linear [J. Thomas et al.,PoP 23, 053108 (2016)] excitation regimes for electrons. It is therefore important to extend the theory for positron acceleration, particularly in the nonlinear regime where the wakefields strongly differ. In this work we explore the wakefield structure, examine the differences between the electron and positron beam cases, and explore positron acceleration in nonlinear regimes. We support our findings with multi-dimensional particle-in-cell simulations performed with OSIRIS [R.A. Fonseca et al., LNCS 2331, 342 (2002)] and quasi-3D [A. Davidson et al., JoCP 281, 1063 (2015)] and QuickPIC [C. Huang et al., JoCP 217, 658 (2006), W. An et al., JCP 250, 165 (2013)].

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Date submitted: 18 Jul 2016 Electronic form version 1.4