Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Optimum Plasma Density and High Transformer Ratio of Plasma Wakefield Accelerator in the Blowout Regime WEI LU, WEIMING AN, CHAN JOSHI, WARREN MORI, UCLA, CHENGKUN HUANG, LANL — In PWFA, accelerating gradient and transformer ratio are two import figures of merit of the wake excitation process.In this talk, simple theories based on a nonlinear wakefield theoretical framework in the blowout regime [1-2] will be presented to predict the optimum density and transformer ratio in the blowout regime. It is found that the peak beam current I_p plays an important role in determining the optimum density and transformer ratio. We show that for narrow beams of low peak current (I_p<<I_A=17kA), the linear theory predictions work well. However for high peak current (I_p∼I_A), the optimum density can be an order of magnitude larger than that predicted by linear theory. In this regime we show that a new condition n_p∼n_b0 should be used, where n_b0 is the peak beam density[3]. Theoretical arguments for this new condition are given and the predictions are confirmed by PIC simulations. It is also found that a high transformer ratio can be achieved for both symmetric and asymmetric shaped bunches. We show that even in the blowout regime wedge shaped beams provide the highest transformer ratio and the highest efficiency. [1] W. Lu et al., PRL,96, 165002 (2006) [2] W. Lu et al., PoP, 13, 5,056709 (2006) [3] W. Lu et al., NJP, Special issue, 2010, in press

Wei Lu
UCLA

Date submitted: 17 Jul 2010 Electronic form version 1.4