Applications of the nonlinear plasma wakefield theory in the blowout regime WEI LU, MICHAIL TZOUFRAS, CHENGKUN HUANG, UCLA, MIAOMIAO ZHOU, WEIMING AN, WARREN MORI, UCLA — In plasma based acceleration for electrons, the blowout regime turns out to be of very importance due to its ability to provide an ideal accelerating and focusing structure and its ability to support large amount of charge (e.g., nC). A theoretical model has been successfully developed to describe this highly nonlinear regime [1]. Based on this model, many important aspects of the blowout regime can be accurately addressed. Here the solutions for four different problems in the blowout regime will be presented, including the optimum plasma density for maximum wakefield amplitude for given beam parameters, beam loading, the transformer ratio for a linearly ramped electron beam driver (optimizing the transformer ratio), and the electron hosing instability. Full and reduced particle-in-cell simulations will be also presented to justify these theoretical analyses. [1] W. Lu et al, Phys. Rev. Lett. 96, 165002 (2006)

Wei Lu
UCLA

Date submitted: 18 Jul 2008   Electronic form version 1.4