Emittance preservation of an electron bunch in a loaded quasi-linear plasma wakefield

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(Dated: June 18, 2017)

We investigate beam loading and emittance preservation for a high-charge electron beam being accelerated in quasi-linear plasma wakefield driven by a short proton beam. The structure of the wakefield is similar to that of a long, modulated proton beam. By selecting transverse and longitudinal electron beam parameters in order to appropriately load of the wake, we show that the bulk of the electron beam can be accelerated without significant emittance growth.

I. INTRODUCTION

- interested from SMI/AWAKE
- requirements for AWAKE Run 2

II. METHOD

Initial beam loading studies were done using the full PIC code Osiris [1]. these simulations were done using a short, pre.dodulated prton drive bunch. That is, we applied a clipped cosine function to the longitudinal density profile of the proton beam, with a period matching the wavelength, λ_p, of the plasma.

A. Simulationn Setup

III. BEAM LOADING

- discussion of the main physics and results; beam loading, bubble creation, emittance preservation

IV. DISCUSSION

V. CONCLUSION

- discussion of optimal electron beam parameters
- implications for AWAKE Run 2

[1] R. A. Fonseca, L. O. Silva, F. S. Tsung, V. K. Decyk, W. Lu, C. Ren, W. B. Mori, S. Deng, S. Lee, T. Katsouleas, and J. C. Adam, in *Computational Science ICCS 2002*, Lecture Notes in Computer Science No. 2331, edited by P. M. A. Sloot, A. G. Hoekstra, C. J. K. Tan, and J. J. Dongarra (Springer Berlin Heidelberg) pp. 342–351.

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