

Abstract Submitted
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Emittance Preservation in Future Plasma Wakefield Accelerators using Adiabatic Matching¹ REZA GHOLIZADEH, University of Southern California, TOM KATSOULEAS, Duke University, PATRIC MUGGLI, University of Southern California, CHENGKUN HUANG, WARREN MORI, University of California, Los Angeles — Plasma Wakefield Accelerator has been proven to be a promising technique to lower the cost of the future high energy colliders by offering orders of magnitude higher gradients than the conventional accelerators. However, it has been shown that ion motion is an important issue to account for in the extreme regime of ultra high intensity and ultra low emittance beams, characteristics of future high energy colliders. In this regime, the transverse electric field of the beam is so high that the plasma ions cannot be considered immobile at the time scale of electron plasma oscillations, thereby leading to a nonlinear focusing force. Therefore, the transverse emittance of a beam matched to the initial linear focusing will not be preserved under these circumstances. However, Vlasov's equation predicts a matched profile even in the nonlinear focusing force case. Furthermore, we extend the idea and introduce a plasma section that can match the entire beam to the mobile-ion regime of plasma by adiabatically reducing the plasma ion mass. We also find the analytic solution for the optimal matching section. Simulation results are presented.

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