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Design considerations and parameter study for a 0.5TeV PWFA afterburner[1] CHENGKUN HUANG, W. LU, M. TZOUFRAS, M. ZHOU, V.K. DECYK, C. JOSHI, W.B. MORI, UCLA — A recent plasma wakefield acceleration (PWFA) experiment using short (∼100fs), high peak current (>10KA) electron beam as driver has demonstrated sustained acceleration gradients of ∼50GeV/m over 85 cm distance [1]. The rapid progress of PWFA experiments has attracted interest regarding the possibility of making an afterburner for a linear collider. In the afterburner concept, an electron beam is placed into the wakefield to extract energy deposited in the wake. We investigate the afterburner concept based on the present understanding of the key physics. Possible design scenarios such as single stage acceleration or integrated design with plasma lens final focusing are studied. The final energy, charges, emittance, energy spread and energy stability of the accelerated electron beam are taken as intrinsic design considerations. Parameters are suggested for a 0.5 TeV afterburner. We also present full scale 3D particle-in-cell simulations of the possible design using a highly efficient and accurate quasi-static code QuickPIC.
[1] Blumenfeld et. al., Nature 445, 741 (2007).

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