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Efficient accelerator afterburner design based on plasma wakefield acceleration[1] CHENGKUN HUANG, UCLA, I. BLUMENFELD, SLAC, C.E. CLAYTON, UCLA, F.-J. DECKER, M.J. HOGAN, R. IVERSON, SLAC, C. JOSHI, UCLA, T. KATSOULEAS, Duke University, N. KIRBY, SLAC, W. LU, K.A. MARSH, W.B. MORI, UCLA, P. MUGGLI, USC, R. SIEMANN, D. WALZ, R. ISCHEBECK, SLAC, M. TZOUFRAS, UCLA — Recent plasma wakefield acceleration (PWFA) experiment using short (∼100fs), high peak current (>10KA) electron beam as wakefield driver has demonstrated sustained acceleration gradient of ∼50GeV/m over 85 cm. The rapid progress of PWFA experiments has attracted interests regarding the possibility of making an "afterburner" for a linear collider. In the "afterburner" concept, electron acceleration is achieved by placing a trailing electron beam into the wakefield (either by beam splitting or external injection) to extract energy deposited in the plasma wave wake. Several important aspects of the "afterburner" design in the blow-out regime, such as wakefield generation, efficient beam loading and hosing instability have been investigated theoretically. These relevant physics will have great impact on the beam quality of a possible "afterburner" design. A multi-stage "afterburner" design with 25GeV energy gain in each stage is explored numerically with a 3D quasi-static code QuickPIC. Parameters are suggested for a 0.5 TeV PWFA afterburner with this design and simulation result will be presented.

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Chengkun Huang
UCLA

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