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Simulations of two-bunch Plasma Wake Field Accelerator on FACET[1] W. AN, W. LU, C. JOSHI, W.B. MORI, UCLA, C. HUANG, LANL, M.J. HOGAN, SLAC, S.F. MARTINS, L.O. SILVA, IST — Previous experiments on FFTB at SLAC demonstrated that short electron bunches can produce accelerating gradient of 50 GeV/m over one meter[1]. These experiments provided the science case for the new FACET facility which will have 23 GeV high current beams. Two-bunch PWFA experiment has a second bunch appropriately loaded into the wake of the first bunch so that the second bunch maintains a narrow energy spread. Simulation results show that in possible two bunch scenarios the first bunch (with less current than that in the FFTB case) still can generate a meter long plasma column via field ionization with a density around $5 \times 10^{16} cm^{-3}$ if a gas with lower ionization threshold is used. The trailing beam can gain ∼10 GeV with a very narrow energy spread. The energy gain can be increased to 25 GeV by using a pre-ionized plasma . The possibility of using a partially ionized pre-plasma instead of the fully pre-ionized plasma is also discussed.

[1] I. Blumenfeld et al., Nature 445, 741 (2007).

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