Abstract Submitted
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Transferring the Energy of Hadron Beams to Lepton Beams via Plasma Wakes[1] W.B. MORI, W. LU, W. AN, C. JOSHI, UCLA, C. HUANG, LANL, J. VIEIRA, R.A. FONSECA, L.O. SILVA, IST — Hadron beams (p^- & p^+) exist at Fermilab and CERN could be used to drive high gradient plasma wakefields for accelerating trailing lepton (e^- & e^+) beams. We consider what would be possible if the existing hadron beams could be compressed and if existing beams excite wakes via self-modulation instabilities. A compressed p^- beam drives an identical wake as an electron beam [1] with the same current. However, for this case dephasing (not pump depletion) limits the acceleration length. Simulation results show that a witness electron bunch can gain more than 600 GeV in a 1 TeV p^- beam driven PWFA during 50 meters acceleration. For the p^+ beam, driving a similar wake by using a short p^+ beam for accelerating electrons has been proposed recently [2]. Although p^+ beam available at CERN is much longer, a train of short bunches may be generated through self-modulation as the long bunch propagates in the plasma [3]. Preliminary simulation results for such interactions will be presented. [1] I. Blumenfeld et al., Nature 445, 741 (2007) [2] A. Caldwell et al., Nature Phys. 5, 363 (2009) [3] N. Kumar et al., Phys. Rev. Lett. 104, 255003 (2010)

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