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Self-modulation of long SLAC particle bunches PATRIC MUGGLI, Max Planck Institute for Physics, JORGE VIEIRA, Instituto Superior Tecnico Lisboa Portugal, LUIS SILVA, Instituto Superior Tecnico, Lisboa Portugal — The transverse self-modulation of ultra-relativistic particle bunches provides a path to the generation of large amplitude wakefields using long drivers [1]. In this work we show that the long electron or positron bunches that are available at SLAC could be used to demonstrate this mechanism. One-to-one OSIRIS simulations were performed in conditions that mimic the propagation of the electron beam available at SLAC in 1 meter long plasmas. The simulations showed that the transverse self-modulation of the electron beam occurs, and that this can lead to the generation of accelerating gradients in excess of 60 GeV/m. As a result, some of the beam electrons gained more than 5 GeV after one meter of propagation. The possibility to seed the transverse self-modulation instability with the initial wake provided by hard cut beams is also examined. In this case, the simulations revealed that stable accelerating gradients exceeding 10 GeV/m over the whole plasma length could be achieved. The asymmetries associated with the transverse self-modulation of electrons and positron beams were also explored.

[1] N. Kumar et al, Phys. Rev. Lett. 104, 255003 (2010).

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