

Abstract Submitted
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Interaction of Ultra relativistic Fireball beam (e^-e^+) with Plasma

NITIN SHUKLA, JORGE VIEIRA, Instituto Superior Tecnico, Lisbon, Portugal, PATRIC MUGGLI, Max Planck Institute for Physics, Munich, LUIS SILVA, Instituto Superior Tecnico, Lisbon, Portugal — Plasma instabilities are strong candidates for seed magnetic field generation to explain radiation processes in Gamma Ray Bursters. Mimicking these extreme conditions in laboratory is still an open challenge. Currently available electron and positron bunches at Stanford Linear Accelerator (SLAC) may provide ideal conditions to investigate magnetic field generation and amplification in the laboratory through the Weibel or Current Filamentation Instability (WI/CFI) [1]. In order to address this possibility we resort to PIC simulations modelling the interaction of fireball bunches with plasmas considering the SLAC bunch parameters. We find that by keeping the number of bunch particles constant that WI/CFI grows faster than Oblique Instabilities (OI) for shorter bunches (with lengths smaller than the plasma wavelength) which provide sufficiently large peak fireball bunch densities. On the contrary, for longer bunches, with lower peak densities, OI grow faster than WI/CFI. We find that both OI and WI/CFI saturate by increasing the beam temperature. Analytical results are in agreement with simulations.

[1] P. Muggli, S.F. Martins, J. Vieira, and L.O. Silva arXiv:1306.4380 (2013).

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