

Kinetic approaches to coherent longitudinal instability driven by a relativistic long charged particle beam in an overdense plasma

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The propagation of relativistic charged particle beam in an overdense plasma is described within the context of both Vlasov-Poisson-like and Wigner-Poisson-like system of equations. The beam is assumed to have the length much greater than the plasma wavelength (long beam limit). This condition allows the plasma to provide an adiabatic shielding of the beam during the mechanism of plasma wake field (PWF) excitation. The coherent instability of the longitudinal beam motion, due to the PWF-based beam self-interaction, is analyzed in both kinetic approaches which are then compared with each other.