Three-dimensional self-modulated beam dynamics of a non-laminar, ultra-relativistic beam in a non-relativistic cold plasma

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Three dimensional self-modulated dynamics of a relativistic charged particle beam is reviewed within the context of the theory of plasma wake field excitation. The self-consistent description of the beam dynamics is provided by coupling the Vlasov equation with a Poisson-type equation relating the plasma wake potential to the beam density. An analysis of the beam envelope self-modulation is then carried out and the criteria for the occurrence of the instability are discussed thereby.

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