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Effects of two-stream instability on electron return current of ion beam propagating in background plasma¹ ERINC TOKLUOGLU, EDWARD STARTSEV, IGOR KAGANOVICH, RONALD DAVIDSON, PPPL — The current and charge neutralization of intense charged particle beams by background plasma enables ballistic beam propagation and has a wide range of applications in inertial fusion and high energy density physics. However, beam-plasma interactions can result in the development of collective instabilities that may have deleterious effects on the ballistic propagation of intense ion beams. In this paper we study an ion beam pulse propagating in a background plasma, which is subject to the two-stream instability between the beam ions and plasma electrons. Making use of the particle-in-cell code LSP we have simulated this interaction over a wide range of beam and plasma parameters. We show that depending on the beam and plasma parameters, there are two different regimes where the instability saturates due to nonlinear wave-trapping effects of either the beam ions or plasma electrons. The two regimes have different scalings for the self-electric and self-magnetic field of the ion beam pulse propagating in the background plasma.

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Erinc Tokluoglu
PPPL

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