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Nonlinear evolution of a relativistic electron beam in a plasma[1]
XIANGLONG KONG, CHUANG REN, University of Rochester, JOHN TONGE, UCLA — The most unstable modes in a relativistic electron beam-plasma return current system are oblique [Bret et al. PRE '04]. Nonlinear evolution of these modes is important to fast ignition and can only be simulated with the beam propagating in the simulation plane. Two-dimensional PIC simulations with this 'in-plane' configuration show that the system evolves to a quasi-steady state stable to the two-stream instability with no bump on tail in the system distribution function. The most energetic field component is the transverse electric field. The beam retains more than 50% of its initial energy. The beam does not become localized in the transverse direction through filamenting and merging, as observed in previous simulations with the beam propagating out of the simulation plane [Lee and Lampe PRL '73]. The simulations also show that as the beam and plasma temperatures increase, the dominant mode becomes increasingly longitudinal.

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