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Relativistic Electron Beam Tunneling Through an Overdense Plasma A.G. SGRO, Los Alamos National Laboratory — 3D simulations of an electron beam encountering an over dense background plasma show that at early times the beam is disrupted by the beam plasma instability. As the beam source continues to emit, background electrons from regions progressively further from the beam source are ejected radially leaving the background ions in the region of the beam. These ions neutralize the beam charge and allow the beam to regain its identity and continue to propagate through the plasma. Thus over long timescales the beam basically digs a channel through the over dense plasma through which it then propagates with approximately its initial average radius without any evident further instability. Previously, this effect has been shown in 2D simulations [1] which resolved only axisymmetric modes, and then in 3D with coarse spatial resolution [2]. These new finely resolved 3D simulations show that non axisymmetric modes grow to larger amplitudes than axisymmetric ones. The result, then, is that the beam acquires a significant non axisymmetric structure while, over long timescales, digging a channel through the background and propagating through it. (LAUR-07-4723)
[1] A. G. Sgro and T. J. T. Kwan, Phys. Plasmas 10, 849 (2003)
[2] A. G. Sgro, Bull. Am. Phys. Soc. 49 (11), 96 (2004).

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