

Abstract Submitted
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Particle-In-Cell Simulation of Ion Beam Neutralization by a Tenuous Background Plasma¹ WILLIAM BERDANIER, GENNADY SHVETS, UT Austin, IGOR KAGANOVICH, PPPL — The neutralization and focusing of intense charged particle beam pulses by electrons forms the basis for a wide range of applications for accelerators, heavy ion fusion, and astrophysics. For intense ion beam pulses, a background plasma can be used to effectively neutralize the beam charge and current, thereby neutralizing the self-fields. We show that even a tenuous background plasma with a small relative density can achieve high neutralization. Using the Large Scale Plasma (LSP) particle-in-cell code, the interaction of an intense ion beam with an underdense plasma was simulated. It was shown that if the total plasma electron charge is comparable to the beam charge, electron emitters are necessary for effective neutralization. These are not needed if the plasma volume is large. A variety of plasma densities was investigated, including the case of emitters without plasma, which did not effectively neutralize the beam. Over 95% neutralization was found for even very tenuous background plasma, in agreement with earlier analytical studies.

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