

Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Filamentation of a Radially Converging Heavy Ion Beam in a Background Plasma with External Solenoidal Magnetic Field¹ EDWARD STARTSEV, RONALD DAVIDSON, PPPL, DALE WELCH, DAVID ROSE, Voss Scientific, Albuquerque NM — Heavy ion inertial fusion and high energy density physics experiments with intense heavy ion beams require the transverse focusing of the ion beam pulse onto a small focal spot. Plasma is used to neutralize the beam's space charge to achieve maximum compression. Unfortunately, a heavy ion beam propagating in a background plasma may be subject to the filamentation instability. The beam can be severely disrupted by the instability before it reaches the target. An external solenoidal magnetic field can be used to stabilize the instability. This paper analyzes the influence of both the transverse convergence and an applied solenoidal magnetic field on the filamentation instability of a cold heavy ion beam propagating in neutralizing background plasma. We employ the WKB approach to analyze the space-time development of the instability and compare it with the results of simulations using the particle-in-cell code LSP. The results of the investigations identify the instability growth rates, levels of saturation, and the conditions for quiescent beam propagation.

¹Research supported by the U. S. Department of Energy.

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Date submitted: 12 Jul 2007

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