HIFAN–1141
LBNL–49649

7/21/03

Scaled beam merging experiment for heavy ion inertial fusion

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Receipt date: June 11, 2003

Abstract

Transverse beam combining is a cost-saving option employed in many designs for heavy ion fusion drivers. However, the resultant transverse phase space dilution must be minimized so as not to sacrifice focusability at the target. A prototype combining experiment has been completed employing four 3-mA Cs^+ beams injected at 160 keV. The focusing elements upstream of the merge consist of four quadrupoles and a final combined-function element (quadrupole and dipole). Following the merge, the resultant single beam is transported in a single alternating gradient channel where the subsequent evolution of the distribution function is diagnosed. The results are in fair agreement with particle-in-cell simulations. They indicate that for some HIF driver designs, the phase space dilution from merging is acceptable.

PACS: 41.85.Ne, 52.58.Hm, 52.59.Sa, 52.65.Rr