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Abstract

Transverse and longitudinal beam compression, together, are a promising approach to the high intensities required for depositing the energy to create high energy density matter and fusion ignition conditions. We have experimentally demonstrated that beam space charge can be neutralized by passing the beam through a localized plasma "plug". This makes it possible to focus a beam of several centimeters radius to a millimeter radius. This neutralization technique is promising step when beam focusing to a small size target is crucial. We are also interested in longitudinal drift compression to a short pulse length of a few nanoseconds using neutralization. The Neutralized Drift Compression Experiment (NDCX-Ia) facility at Lawrence Berkeley National Laboratory (LBNL) has been used to test these techniques. Here a 300 keV, 25-milliamp K^+ ion beam is given a head to tail energy variation using a tilt core induction cell. Pulse compression and focusing are achieved in the presence of neutralizing plasma provided by an Al arc or MEVVA source. Neutralized drift compression simulations predict that given adequate neutralization of the beam charge and current, the compression ratio is limited only by the accuracy of the applied velocity tilt and the longitudinal temperature of the beam. In the NDCX, the beam ion velocities deviate somewhat from an ideal curve with simulations predicting a compression ratio of roughly 60, experimentally we have measured above 50 fold compression with a time scale of <5 ns at FWHM. In this presentation experimental progress will be presented.

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