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PLANS FOR LONGITUDINAL AND TRANSVERSE NEUTRALIZED BEAM COMPRESSION EXPERIMENTS AND INITIAL RESULTS FROM SOLENOID TRANSPORT*

P.A. Seidl, J. Armijo, D. Baca, F.M. Bieniosek, J. Coleman, E. Henestroza, M. Leitner, B.G. Logan, P.K. Roy, W.L. Waldron, and S.S. Yu
Lawrence Berkeley National Laboratory, Berkeley, CA 94720, U.S.A.

A. Friedman, M. Kireeff-Covo, D. Grote, A.W. Molvik, W. Sharp and J.L. Vay
Lawrence Livermore National Laboratory, Livermore, CA 94550, U.S.A.

I. Haber
University of Maryland, College Park, MD 20742-3511 CA, U.S.A.

A.B. Sefkow, E.P. Gilson, P.C. Efthimion, I. Kaganovich, and R. C. Davidson
Princeton Plasma Physics Laboratory, Princeton, NJ 08543-0451, U.S.A.

D.V. Rose and D.R. Welch
Voss Scientific, Albuquerque, NM 87108, U.S.A.

This paper presents plans for neutralized drift compression experiments, precursors to future target heating experiments. The target-physics objective is to study warm dense matter (WDM) using short-duration (~ 1 ns) ion beams that enter the targets at energies just above the dE/dx peak. High intensity on target is achieved by a combination of longitudinal compression and transverse focusing. This work will build upon recent success in longitudinal compression, where the ion beam was compressed lengthwise by a factor of more than 50 by first applying a linear head-to-tail velocity tilt to the beam, and then allowing the beam to drift through a dense neutralizing background plasma. In separate experiments, transverse beam-density enhancement by a factor of $\sim 10^2$ was demonstrated when a converging, space-charge-dominated ion beam was neutralized by a plasma source. It is planned to demonstrate *simultaneous* transverse focusing and longitudinal compression in a series of future experiments, thereby achieving conditions suitable for future WDM target experiments.

Future experiments may use solenoids for transverse confinement of un-neutralized ion beams during acceleration. Recent results are reported in the transport of a high-perveance heavy-ion beam in a solenoid transport channel. The principal objectives of this solenoid transport experiment are to match and transport a space-charge dominated ion beam, and to study associated electron-cloud and gas effects that may limit the beam quality or beam control in a solenoid transport system. Ideally, the beam would establish a Brillouin-flow condition (rotation at one-half the cyclotron frequency). Other mechanisms that would degrade beam quality are being studied, such as focusing-field aberrations, beam halo, and separation of lattice focusing elements.

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