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Transverse Beam Compression by Adiabatic Waveform Changes in the Paul Trap Simulator Experiment (PTSX)[1] E.P. GILSON, M. CHUNG, R.C. DAVIDSON, M. DORF, P.C. EFTHIMION, R. MAJESKI, E.A. STARTSEV, Princeton Plasma Physics Laboratory — The Paul Trap Simulator Experiment (PTSX) is a compact laboratory Paul trap that simulates a long, thin charged-particle bunch coasting through a kilometers-long magnetic alternating-gradient transport system by putting the physicist in the frame-of-reference of the beam. The transverse dynamics of particles in both systems are described by the same sets of equations – including all nonlinear space-charge effects. Results are presented from experiments in which the amplitude and frequency of the applied confining voltage are adiabatically changed over time in order to transversely compress a beam with an initial depressed-tune $\nu/\nu_0 \sim 0.9$. Emphasis is placed on determining the conditions that minimize emittance growth and the number of particles that are found at large radius (so-called halo particles) after the beam compression. It is found that increases of up to a factor of two in the lattice strength can be implemented in only four lattice periods. The results of PIC simulations performed with the WARP code agree well with the experimental data.

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