Transverse compression of an intense ion beam, traveling through a periodic-focusing quadrupole lattice[1] MIKHAIL DORF, RONALD C. DAVIDSON, EDWARD STARTSEV, Plasma Physics Laboratory, Princeton University, New Jersey 08543 — The transverse compression and dynamics of an intense beam, propagating through a periodic quadruple lattice, plays an important role for many accelerator physics applications. Typically, the compression can be achieved by means of increasing the focusing strength of the lattice along the beam propagation direction. However, beam propagation through the lattice transition region inevitably leads to a certain level of beam mismatch and halo formation. In this work we present a detailed analysis of these phenomena using the envelope equations in the smooth focusing approximation, which describe the average effects of a periodic lattice, and full particle-in-cell numerical simulations using the WARP code, taking into account the effects of the periodic-focusing quadrupole field. Simulations are presented for both space-charge-dominated beams, and beams with a moderate space-charge strength.

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Date submitted: 21 Jul 2005

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