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Theory and Simulation of Passive Focusing of an Ion Beam Propagating Through Thin Foils[1] S.M. LUND, R.H. COHEN, LLNL, P. NI, LBNL, A. YUEN, UC Berkeley — Ion beams (including protons) with low emittance and high space-charge intensity can be propagated with normal incidence through a sequence of thin metallic foils separated by vacuum gaps to collimate the beam or to focus it to a small transverse spot. The foils attenuate the beam's defocusing electrostatic field, allowing the focusing magnetic pinch force to dominate. We present envelope calculations and particle simulations of this effect, with particular application to near-term experiments using intense proton beams derived from laser-illuminated foils (TNSA process) and fusion drivers using accelerator-produced heavy ions. Several extensions have been added to earlier idealized calculations,[2] including finite pulse length, electrons emitted from and ion scattering in foils, and realistic velocity-space distributions of the incident beam.

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[2]S.M. Lund, R.H. Cohen and P Ni, "Envelope Model for Passive Magnetic Focusing of an Intense Ion or Proton Beam Propagating Through Thin Foils", Phys. Rev. ST-AB, in press (2012)

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