Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Filling Factor for an Electrostatic Quadrupole Lattice C.M. CELATA, F.M. BIENIOSEK, P.A. SEIDL, LBNL, L. PROST, FNAL, D.P. GROTE, LLNL, THE HEAVY ION FUSION VIRTUAL NATIONAL LABORATORY COLLABORATION — The cost of an accelerator is in part determined by the size of the beam pipe aperture. The effect on total cost is especially large for multiple-beam induction linac designs for IFE drivers, where extra clearance for each beam greatly enlarges the transverse scale of the machine. Limits to the amount of clearance between the beam and the vacuum pipe are set by nonlinear forces (image forces, focusing fringe fields, etc.), which can cause beam heating or beam loss. The filling factor possible (i.e., percent of aperture filled with beam), or "dynamic aperture," is investigated in this work for the intense, space-charge-dominated ion beams of an IFE driver, using the 2-D transverse slice version of the 3-D particle-in-cell simulation code WARP. The focusing field is modeled using a 3-D solution of the Laplace equation for the biased quadrupole focusing elements, as opposed to previous calculations, which used a less-accurate multipole approximation. 80% radial filling of the aperture is found to be possible. Results from the simulations, as well as corroborating data from the High Current Experiment at LBNL, will be presented.

C.M. Celata
LBNL

Date submitted: 25 Jul 2005 Electronic form version 1.4