Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Laser Channeling in Millimeter-Scale Underdense Plasmas of Fast Ignition G. LI, R. YAN, C. REN, V.N. GONCHAROV, Laboratory for Laser Energetics, U. of Rochester, T.L. WANG, J. TONGE, W.B. MORI, U of California, LA — Two-dimensional particle-in-cell simulations show that laser channeling in millimeter-scale underdense plasmas is a highly nonlinear and dynamic process involving laser self-focusing and filamentation, channel expansion through ponderomotive blowout and high-Mach-number shock waves, plasma density snowplowing, laser hosing, and channel bifurcation and merging. The channeling speed is much less than the laser linear group velocity. The simulations find that the channeling time T_c and the total required energy to reach the critical surface, E_c, scale with the laser intensity I as $T_c \sim I^{-0.64}$ and $E_c \sim I^{0.36}$. The scaling shows that low-intensity channeling pulses are preferred to minimize the required pulse energy but with an estimated lower bound on the intensity of $I \approx 4 \times 10^{18}$ W/cm^2 if the channel is to be established within 100 ps. These results will also be compared with those from smaller-scale 3-D simulations. This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreements DE-FC52-92SF19460, DE-FC02-04ER54789, and DE-FG02-06ER54879.

G. Li
Laboratory for Laser Energetics, U. of Rochester

Date submitted: 18 Jul 2007

Electronic form version 1.4