Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Laser Beam Propagation in Large-Scale NIF Plasmas[1] SIEGFRIED GLENZER, D.H. FROULA, L. DIVOL, M. DORR, R.L. BERGER, S. DIXIT, C. HAYNAM, J.P. HOLDER, O.S. JONES, D. KALANTAR, S. LANGER, B.J. MACGOWAN, N. MEEZAN, C. NIEMANN, B. STILL, R. WALLACE, B.A. HAMMEL, E. MOSES, Lawrence Livermore National Laboratory, NIF TEAM COLLABORATION — The propagation of intense, high-energy laser beams through large-scale length plasmas has been measured with the first experiments on the National Ignition Facility. X ray imaging data show that smoothed beams propagate through the full length of a 7 mm long fusion-scale plasma burning through at t=1.5 ns. However, unsmoothed beams show whole beam self-focusing, beam spray and stalled propagation until the end of the 3.5 ns-long experiment. Integrated calculations that use realistic beams verify the effectiveness of beam smoothing which lowers the power fraction of high intensity speckles in the laser beam that are above threshold for filamentation. This ability to model the results quantitatively allows us to specify the laser beam intensity and smoothing for future laser fusion experiments.

[1]This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-ENG-48.

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Date submitted: 25 Jul 2005 Electronic form version 1.4