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Laser Channeling in mm-Scale Underdense Plasmas for Fast Ignition C. REN, G. LI, R. YAN, University of Rochester, J. TONGE, T.-L. WANG, W.B. MORI, UCLA — Recent 2D PIC simulations for laser channeling in mm-scale underdense plasmas show many new phenomena that were not present in previous 100 m-scale experiments and simulations, including plasma buildup to above critical density in front of the laser, laser hosing/refraction, channel bifurcation and self-correction, and electron heating to relativistic temperatures [G. Li et al., PRL **100,** 125002 (2008)**.**] The channeling speed is much less than the linear group velocity of the laser. A scaling from the simulations shows that low-intensity channeling pulses are preferred to minimize the required energy. Significant improvement of the transmission of the ignition pulse in a preformed channel has been demonstrated. New 3D PIC simulations show that the channeling speed is larger in 3D than in 2D due to stronger laser self-focusing. This work was supported by the U.S. DoE under Grants No. DE-FG02-06ER54879, DE- FC02-04ER54789, DE-FG52-06NA26195, and DE-FG02-03ER54721. Simulations were carried out at NERSC through an INCITE grant and on the UCLA DAWSON Cluster under Grant No. NSF-Phy-0321345.

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