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Laser channeling in mm-scale underdense plasmas of fast ignition targets[1] C. REN, G. LI, R. YAN, University of Rochester, T.-L. WANG, J. TONGE, W.B. MORI, UCLA — In the fast ignition approach to laser fusion, nonlinear laser-plasma interactions could cause significant energy loss for an ignition laser in an underdense plasma. One way to avoid this is to use a channeling pulse to create a low-density channel for the ignition pulse. Two dimensional Particle-in-cell simulations show that laser channeling in mm-scale underdense plasmas has many new phenomena that are not present in previous short-scale experiments and simulations, including plasma buildup to n_c in front of the laser, laser hosing/refraction, channel bifurcation, and self-correction and electron heating to relativistic temperatures. The channeling speed is much less than the linear group velocity of the laser. The simulations find that low- intensity channeling pulses are preferred to minimize the required laser energy. The channel is also shown to significantly increase the transmission of an ignition pulse.

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