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Laser Channeling in an Inhomogeneous Plasma for Fast-Ignition Laser Fusion S. IVANCIC, D. HABERBERGER, W. THEOBALD, K.S. ANDERSON, D.H. FROULA, D.D. MEYERHOFER, Laboratory for Laser Energetics, U. of Rochester, K. TANAKA, H. HABARA, T. IWAWAKI, Osaka University — The evacuation of a plasma cavity by a high-intensity laser beam is of practical importance to the channeling fast-ignition concept. The channel in the plasma corona of an imploded inertial confinement fusion capsule provides a clear path through the plasma so that the energy from a second high-intensity laser can be deposited close to the dense core of the assembled fuel to achieve ignition. This study reports on experiments that demonstrate the transport of high-intensity ($> 10^{17}$ W/cm^2) laser light through an inhomogeneous kilojoule-laser–produced plasma up to overcritical density. The multikilojoule high-intensity light evacuates a cavity inside the focal spot, leaving a parabolic trough that is observed using a novel optical probing technique—angular filter refractometery.[1] The cavity forms in less than 100 ps using a 20-TW laser pulse and bores at a velocity of ~ 2 μm/ps. The experimentally measured depths of the cavity are consistent with a ponderomotive hole-boring model. The experiments show that 100-ps IR pulses with an intensity of $\sim 5 \times 10^{17}$ W/cm^2 produced a channel up to the critical density, while 10-ps pulses with the same energy but higher intensity did not propagate as far. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0001944.

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S. Ivancic
Laboratory for Laser Energetics, U. of Rochester

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