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Kinetic Plasma and Turbulent Mix Studies using DT Plastic-shell Implosions with Shell-thickness and Pressure Variations Y. KIM, H.W. HERRMANN, N.M. HOFFMAN, M.J. SCHMITT, P.A. BRADLEY, G. KAGAN, LANL, S. GALES, C.J. HORSFIELD, M. RUBERY, A. LEATHERLAND, AWE, M. GATU JOHNSON, MIT, V. GLEBOV, W. SEKA, F. MARSHALL, C. STOECKL, LLE, J. CHURCH, LLNL — Kinetic plasma and turbulent mix effects on inertial confinement fusion have been studied using a series of DT-filled plastic-shell implosions at the OMEGA laser facility. Plastic capsules of 4 different shell thicknesses (7.4, 15, 20, 29 micron) were shot at 2 different fill pressures in order to vary the ion mean free path compared to the size of fuel region (i.e., Knudsen number). We varied the empirical Knudsen number by a factor of 25. Measurements were obtained from the burn-averaged ion temperature and fuel areal density. Preliminary results indicate that as the empirical Knudsen number increases, fusion performances (e.g., neutron yield) increasingly deviate from hydrodynamic simulations unless turbulent mix and ion kinetic terms (e.g., enhanced ion diffusion, viscosity, thermal conduction, as well as Knudsen-layer fusion reactivity reduction) are considered. We are developing two separate simulations: one is a reduced-ion-kinetics model and the other is turbulent mix model. Two simulation results will be compared with the experimental observables.

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