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Modeling the Effects of Ion Viscosity on the Dynamics of OMEGA Direct-Drive Cryogenic Implosions IOGR IGUMENSHCHEV, OWEN MANNION, JAMES KNAUER, RICCARDO BETTI, MIKE CAMPBELL, DUC CAO, VALERI GONCHAROV, VARCHAS GOPALASWAMY, DHRUMIR PATEL, SEAN REGAN, RAHUL SHAH, ALEX SHVYDKY, WOLFGANG THEOBALD, Lab for Laser Energetics, DAN CLARK, MARTY MARINAK, LLNL, BRIAN HAINES, LANL — The hot-spot–ignition concept in inertial confinement fusion utilizes laser-driven implosions of spherical shell targets with DT ice as a fuel. Estimates of the physical conditions before and during the formation of the center hot spot in OMEGA-scale implosions reveal that the Knudson number can approach unity in the low-density interior of targets, indicating the potential importance of kinetic effects. To investigate these effects, cryogenic OMEGA implosions were simulated using the 3D hydrodynamic code ASTER, which includes the ion viscosity model assuming the Spitzer ion free path. The dependences of simulations results on the exact implementation of the viscosity model, including the effects of momentum and heat-flux limitations and using the energy conservation scheme, are studied. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856.

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