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MHD simulation of direct laser-driven magnetic-flux compression with Nautilus C.D. ZHOU, J. LOVERICH, A. HAKIM, Tech-X Corporation — Direct laser-driven magnetic-flux compression is an innovative approach to achieve magneto-inertial fusion (MIF). A cylindrical target with initial seed magnetic field is compressed by energetic laser beams. The magnetic field that is "frozen-in" the plasma gets compressed with the target. The resulting high magnetic field reduces electron thermal conductivity and improves alpha particle confinement, thus providing an additional thermal insulation of the fuel forming the hot spot. Numerical simulations of magneto-inertial fusion implosions require realistic equation of states, thermonuclear fusion energy generation and laser energy deposition coupling with MHD equations. These simulations are important in stability and scaling studies of MIF implosions. Nautilus is a multidimensional shock-capturing MHD simulation framework developed at Tech-X. Incorporated with PROPACEOS equation of states, fusion reaction and laser ray tracing modules, it is utilized to perform direct laser-driven magnetic-flux compression implosions. Simulation results and relevant Nautilus features are discussed.

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