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Simulation of Magnetically Driven HEDP/ICF Experiments with a Lagrangian/ALE Code C.L. ROUSCULP, T.A. GIANAKON, K. LIPNIKOV, T.R. WATERS, Los Alamos National Laboratory — Magnetic drive has recently received a great deal of attention in the context of high energy density physics (HDEP) as well as inertial confinement fusion (ICF). Here, stored electrical energy in converted into mega-Gauss level magnetic fields that accelerate a conductor that, in turn, drives materials to HEDP regimes or compresses fusion fuel. Most prevalent are cylindrical Z-pinch configurations where a pulsed, axial current generates an azimuthal field via Lorentz forces. The system may or may not be complemented by a static axial field to aid in confinement. Another configuration utilizes a planar geometry for either shocked or quasi-isentropic loading. In order to study the performance of these emerging designs, sophisticated computational tools are required. At the very least, a single-fluid, resistive, magneto-hydrodynamics (MHD) model must be implemented. Shown here are recent developments and applications of the Lagrangian/ALE FLAG code to such problems. Through verification test problems, an explicit, ideal MHD algorithm is shown to be second order on smooth test problems and first-order on problems involving shock discontinuities. The operator-split, implicit, resistive diffusion algorithm is shown to be second-order on arbitrary polyhedral/polygonal meshes. Finally, results of simulation of relevant Z-pinch and planer configurations for HEDP and ICF applications are shown.

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