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Implicit XMHD Modeling of Fast Z-Pinches MATTHEW MARTIN, Sandia National Laboratories — The numerical modeling of fast Z-Pinches as applied to magnetically driven inertial confinement fusion concepts is typically performed under the resistive- magnetohydrodynamic (MHD) model. We derive the limitations of this model as currently applied to modeling such targets and present numerical test problems that demonstrate the physical error introduced through the approximations inherent in resistive-MHD. We then compare the resistive-MHD model to simulations utilizing new implicit algorithms for the efficient solution of the extended-magnetohydrodynamic (XMHD) system of equations. Herein we define XMHD as a quasi-neutral electro-magnetic two-fluid model. We present specific examples where the XMHD system of equations is required for modeling magnetically driven ICF targets if large physical errors are to be avoided in the numerical solution of the system. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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