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Ideal Z-Pinch Instabilities Across Fluid Plasma Regimes JOHN LOVERICH, AMMAR HAKIM, Tech-X Corporation — In this paper we model instabilities in high density Z-pinches across fluid plasma regimes. The theory of MHD instabilities in a Z-pinch plasma is well understood, in this paper we look at numerical predictions that extend well beyond MHD to a variety of high energy density fluid models. Currently, researchers at Tech-X are investigating Hall MHD, Two-Fluid and Gyroviscous models of plasma to properly model fast fluid plasma processes that are high density, but where the plasma size approaches the ion magnetization scale length. It is in this regime that electron drift velocities are high relative to the ion acoustic speed and a number of new instabilities begin to emerge that cannot be modeled with traditional MHD theory and where numerical methods are highly desirable for modeling the non-linear effects. Results are presented for Z- pinch simulations using ideal fluid models with comparison to MHD. In time, we hope to model other key effects such as radiation and ionization in addition to developing algorithms for better modeling the vacuum region.

John Loverich
Tech-X Corporation

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