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Evolution of the 3D structure of the magneto Rayleigh-Taylor instability in imploding liner Z-pinch fusion schemes JEREMY CHITTENDEN, SIMON VICKERS, Imperial College, DANIEL SINARS, RYAN MCBRIDE, Sandia National Laboratories — Imploding aluminum or beryllium Z-pinch liners provide a method of directly compressing fusion fuel to high densities and temperatures, with excellent energy coupling efficiency. The presence of large magnetic fields also provides a method of suppressing thermal conduction losses and increasing alpha particle confinement, significantly reducing the rho-R criterion required for ignition. A critical requirement is the final integrity of the inside surface of the liner which is used to compress the fusion fuel and which would be significantly degraded should the Rayleigh-Taylor instability grow to large amplitude. Recent experiments at Sandia National Laboratory have provided high quality radiography data which can be used to test the ability of MHD codes to model the Rayleigh-Taylor instability in such liners. We present three dimensional resistive magneto-hydrodynamic simulation results which examine the characteristic Rayleigh-Taylor wavelengths and growth rates and the sensitivity of these results to assumptions of the model. The differences between the Rayleigh-Taylor growth in 2D and 3D are highlighted. Departures from azimuthal symmetry are found to be increasingly important as the implosion approaches the axis and play a pivotal role in determining the peak energy density of the fuel.

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