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The effect of electro-thermal and electro-choric instabilities and material strength on MagLIF liner stability JAMES PECOVER, JEREMY CHITTENDEN, Imperial College London — Magnetized liner inertial fusion (MagLIF) is a promising route to controlled thermonuclear fusion. The concept involves magnetically imploding a metal liner containing fuel with an azimuthal magnetic field (B_z); a key limitation of such systems is the magneto-Rayleigh-Taylor (MRT) instability. MagLIF relevant liner implosions with B_z =0 carried out at SNL showed high amplitude MRT growth; we present a quantitative comparison between experimental results and 3D results from our MHD code Gorgon, demonstrating closer agreement for the MRT properties with the inclusion of electro-thermal and electro-choric instabilities (ETI and ECI) and material strength. The ETI and ECI result in early time azimuthally correlated structures which provide a seed for the MRT. Material strength increases the ETI amplitude due to positive feedback during the solid phase of the liner. Similar liner implosions with B_z exhibited a re-orientation of the MRT into helical structures, which are yet to be reproduced by simulations without an artificial helical initialisation. Our 3D Gorgon results with B_z show helices prior to vapourisation; these occur at initially positive angles before changing sign, tending to zero later in time. This angle does not follow the relative magnitudes of B_z and B_θ as would be expected for the MRT. The angle instead follows the ratio of axial and azimuthal currents (induced by compression or rarefaction of the initial B_z), indicating an electro-thermal origin.

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