Abstract Submitted
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Magneto-acoustic waves driven by self-generated magnetic field: relevance to helical structures in MagLIF experiments JONATHAN DAVIES, DANIEL BARNAK, RICCARDO BETTI, ADAM CARREON, PO-YU CHANG, GENNADY FIKSEL, University of Rochester — The observation of coherent helical structures in liner implosions on Z when an axial magnetic field more than 100 times smaller than the azimuthal field is added has yet to be adequately explained [1]. The results have been reproduced in a 3D MHD code by initializing helices on the outer surface, but this produces helices independently of the axial magnetic field [1]. We present the hypothesis that helices are seeded by self-generated magnetic field, which adds a driving term to the dispersion relation for magneto-acoustic waves when there is a temperature gradient perpendicular to the fluid motion. The key feature of this instability is that it is stable when magnetic pressure exceeds a fraction of the thermal pressure, therefore, instability driven by the helical field resulting from the combination of the initial axial field and the growing azimuthal field will stabilize before the net field has a small pitch angle and before the implosion starts, seeding helices on the surface. This work was supported by the Department of Energy National Nuclear Security Administration, Award Number DE-NA0001944, and the Fusion Science Center supported by the Office of Fusion Energy Sciences, Number DE-FG02-04ER54786.

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