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Assessing the Origins of the Helical Instability in Axially Magnetized Liner Implosions M.R. GOMEZ, D.A. YAGER-ELORRIAGA, N.D. HAMLIN, C.A. JENNINGS, M.R. MARTIN, M.R WEIS, E.P. YU, Sandia National Laboratories, A.B. SEFKOW, University of Rochester — Magneto-inertial fusion concepts leverage magnetic fields to reduce thermal conduction losses and relax fuel areal density requirements. In MagLIF [Slutz, Phys. Plasmas 17, 056303 (2010)], an axial magnetic field is applied to a cm-scale metallic liner containing fusion fuel. Radiographs of magnetized implosions show helical instability structures despite the axial field being much lower than the azimuthal drive field [Awe, Phys. Rev. Lett. 111, 235005 (2013)]. Several hypotheses for the origin of these helical structures exist including magnetic flux compression [Ryutov, AIP Conf. Proc. 1639, 63 (2014), Seyler, Phys. Plasmas 25, 062711 (2018)], a seed from the electrothermal instability [Awe, Phys. Plasmas, 21, 056303 (2014)], and plasma bombardment of the liner surface [Sefkow, BAPS.2016.DPP.UI3.6]. Determining the physical mechanism responsible for the helical instability is a necessity to be able to predict how the instability will scale to higher currents. We have developed an experimental platform to begin discerning between these hypotheses on the Z machine. Specifically, the experiments address the hypothesis of magnetic flux compression through a change in the available flux while maintaining the same initial magnetic field. Simulations, experimental designs, and results will be presented. *Sandia National Laboratories is a multi-mission laboratory managed and operated by NTESS, LLC., a wholly owned subsidiary of Honeywell International, Inc., for the U.S. DOE's NNSA under contract DE-NA0003525.

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