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Quantification of Eddy Currents and Their Effects on Plasma Start-up in a Conducting, Double-walled Spherical Tokamak[1] L. BERZAK, Princeton Plasma Physics Laboratory, R. KAITA, T. KOZUB, N. LOGAN, R. MAJESKI, J. MENARD, L. ZAKHAROV — The Lithium Tokamak eXperiment (LTX) is designed to investigate the novel, low-recycling lithium wall operating regime for magnetically confined plasmas. LTX reaches this regime through a heated shell coated with liquid lithium internal to the vacuum vessel and conformal to the plasma last-closed-flux surface. This structure is closely coupled to the plasma, highly conductive, and not axisymmetric. The three-dimensional nature of the shell causes the eddy currents and resultant magnetic fields to be three-dimensional as well. An extensive array of magnetic diagnostics has been designed with three-dimensional capabilities and implemented to quantify the temporal history and magnitude of error fields due to the large eddy currents. Primary sources and paths of eddy currents have been elucidated. To further quantify eddy currents and to develop a means of mitigating their effect during the low density, low temperature plasma start-up phase, two- and three-dimensional electromagnetic codes have been developed. Data analysis coupled with simulations has led to a successful approach to plasma start-up in the presence of these non-axisymmetric eddy currents.

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