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Accurate Physical and Electromagnetic Tokamak Model Developed with a Response Function Technique[1] L. BERZAK HOPKINS, R. KAITA, R. MAJESKI, L. ZAKHAROV, Princeton Plasma Physics Laboratory —
Accurate models which incorporate diagnostic responses, vacuum vessels, and the other conducting structures required by tokamaks are critical for designing machine operations and for calculating highly constrained equilibrium reconstructions to analyze plasma performance. A novel Discharge Development Code (Cbddc) has been developed for the purpose of building such a model. This code links an infinitely thin, finite conductivity, three-dimensional triangular mesh with a response function technique to yield a millimeter-scale match between the simulated model and the as-built physical construction of the tokamak. This technique has been utilized to calibrate magnetic diagnostics and to construct an accurate model of the Lithium Tokamak eXperiment (LTX), based on a triangular mesh with 83,500 elements. Cbddc has also been implemented to simulate three-dimensional eddy currents in the non-axisymmetric, conducting structures incorporated into LTX. The flexibility of the code permits it to be generally applicable to new machines, such as ITER, as well as non-axisymmetric experiments, such as stellarators.

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