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Model Development and Validation of Geometrically Complex Eddy Current Coils Using Finite Element Methods

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Multiple FEM models of complex eddy current coil geometries were created and validated to calculate the change of impedance due to the presence of a notch. Capable realistic simulations of eddy current inspections are required for model assisted probability of detection (MAPOD) studies, inversion algorithms, experimental verification, and tailored probe design for NDE applications. An FEM solver was chosen to model complex real world situations including varying probe dimensions and orientations along with complex probe geometries. This will also enable creation of a probe model library database with variable parameters. Verification and validation was performed using other commercially available eddy current modeling software as well as experimentally collected benchmark data. Data analysis and comparison showed that the created models were able to correctly model the probe and conductor interactions and accurately calculate the change in impedance of several experimental scenarios with acceptable error. The promising results of the models enabled the start of an eddy current probe model library to give experimenters easy access to powerful parameter based eddy current models for alternate project applications.

References

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