

Public Abstract

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Department:Electrical Engineering

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Title:High-Speed, High-Accuracy Method for Mutual Inductance Calculations

Three methods for calculating the mutual inductance of coils are examined and compared: a finite-element field code analysis method, theoretical analysis method, and F. W. Grover's tabular method. When compared to finite-element field code results, theoretical analysis is found to be highly accurate, but suffers from long calculation times and the inability to calculate accurately by hand. Grover's tabular method is thoroughly examined and is found to have unacceptable accuracy. This research provides insight into the cause of the inaccuracy using Grover's method and gives a procedure for improving the accuracy of the method to an acceptable level. Grover's tabular method is desirable for use because of its simplicity and speed.

Highly accurate mutual inductance calculations are important in many areas of science and engineering including MEMS, pulsed power, and RF engineering. Providing researchers with a quick, accurate, and easy to use method for mutual inductance calculations was the primary goal of this research. With the procedures and insights provided from this research this goal was achieved.