Abschlussarbeiten

Betreuer: M. Sc. Mohammad Ali
Telefon: +49 (0) 511 / 762-3778
E-Mail: mohammad.ali@ial.uni-hannover.de

Institut für Antriebssysteme und Leistungselektronik

Fachgebiet für Leistungselektronik
und Antriebsregelung
Prof. Dr.-Ing. Axel Mertens

Modeling and Analysis of Electromagnetic Field Couplings in EMI Filter Inductors

Common mode inductors are widely used in EMI filters and play important roles in CM conducted EMI suppression. The frequency characteristics of CM inductor will greatly affect the performance of corresponding EMI filters. However, due to several factors such as the nonlinear characteristics of ferrite core versus frequency, leakage inductance and parasitic capacitance of windings, etc, CM inductors' frequency characteristics may be much different from ideal design when operating at high frequency. For example, in some cases, resonance between inductance and parasitic capacitance may greatly deteriorate the EMI level of the whole circuit. For better selecting CM inductors, designing EMI filters, and suppressing EMI, it is necessary to get the high-frequency models of CM inductors.

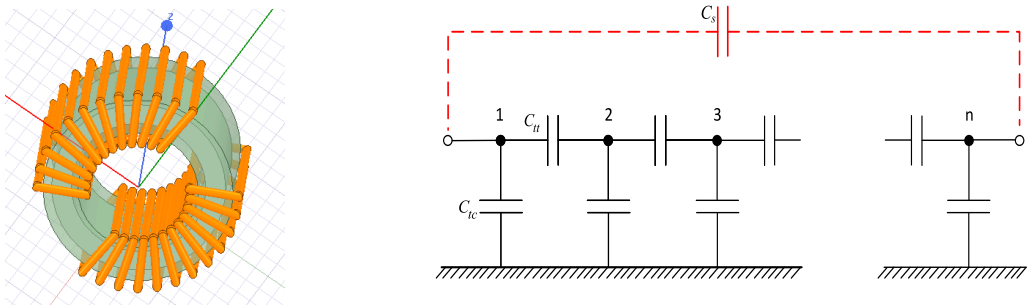

Fig. 1: Simplified model for stray capacitance

A next step is the experimental analysis of electromagnetic couplings of EMI filter inductors. For this, a suitable measurement setup has to be built in our lab. With the help of the impedance analyzer Bode-100, the filter inductors' attenuation and impedance have to be measured by amplitude and phase. The following tasks are offered:

- Investigate the parasitic capacitive couplings of CM chokes and DM inductors
- Modeling the structure in 3D FEM
- Analysis of the magnetic materials such as ferrites and nanocrystalline alloys
- Investigation of the parasitic capacitance cancellation technique for CM and DM inductors
- Analysis of the magnetic couplings between filter inductors according to different arrangements

Forschungsschwerpunkt: Filter Design

	viel				wenig
Leistungselektronik	☐	☒	☐	☐	☐
Bauelemente	☒	☐	☐	☐	☐
Elektrische Antriebe	☐	☐	☒	☐	☐
Energienetze	☐	☐	☐	☐	☒

	viel				wenig
Hardware	☒	☐	☐	☐	☐
Simulation	☒	☐	☐	☐	☐
Regelungstechnik	☐	☐	☐	☐	☒
Programmierung	☐	☐	☐	☐	☒

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