Project thesis

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Analysis of the effect of parasitic capacitances of Transformer on switching waveforms of DC/DC Converters

Introduction

Isolated bi-directional DC/DC Converters consists of MF Transformers for isolation and voltage level adjustment. A Dual-Bridge Series Resonant Converter is an isolated, bi-directional DC/DC converter topology. Two full bridges are connected by a resonant tank and the MF transformer. The transformer used in this converter has a turns ratio equal to the ratio of nominal output and input voltages of the converter. A large magnetizing inductance is used so that it does not participate in the resonance near the switching frequency. The converter functions with Zero Voltage Switching (ZVS) for nominal conditions, but loses ZVS for converter gains away from unity. Loss of ZVS on one of the bridges causes significant effects on the switching voltages of the other bridge. The parasitic capacitances of the transformer can have a significant influence on this behaviour.

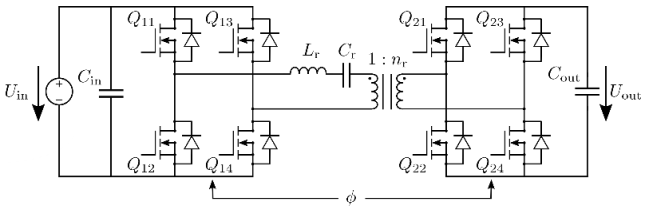

Fig. 1 Topology of SRC-DAB

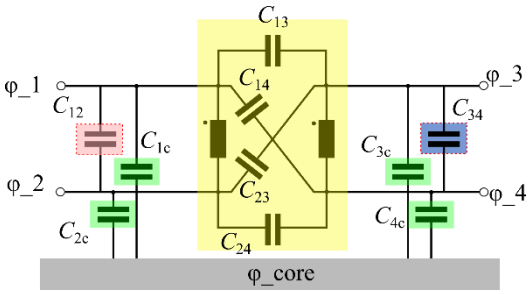

Fig. 2 Parasitic capacitance model of a transformer

Project description

The main objective of this project work is to analyze the effects of the parasitic capacitances of the MF transformer on the switching of the SRC-DAB Converter. The initial task would be determining a suitable model for the MF Transformer that includes parasitic capacitances. Using this model, a detailed simulation model of the converter is to be setup. The influence of different capacitances on the switching waveforms is to be determined. Finally, experimental verification is to be done to verify the observations from the simulations.

Forschungsschwerpunkt:

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

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

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