

Analytical Modelling of Dual-Bridge Series-Resonant Converter

Introduction

Solid-State transformers (SST) consist of isolated bi-directional DC-DC Converters as a link between the Active Front End (AFE) and the DC-AC converter to adjust the voltage between the two DC links. Dual-Bridge Series Resonant Converter (SRC-DAB) is one of the promising topologies for such applications. Fig. 1 shows the topology of the converter which consists of two active full bridges connected through a LC resonant tank and a transformer. It has some benefits and drawbacks compared to other popular topologies like Dual-Active Bridge Converter and LLC Converter.

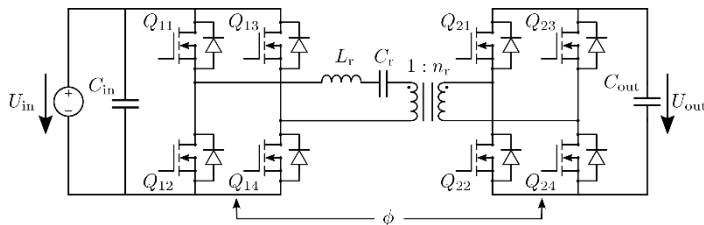


Fig. 1 Topology of SRC-DAB

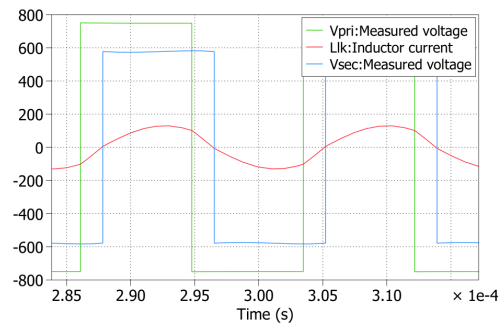


Fig. 2 Typical waveforms of SRC-DAB

Project description

In the scope of this thesis, the SRC-DAB converter is to be modelled analytically. A thorough literature review of the existing modelling techniques is to be done. The modeling shall consider the following aspects in particular:

- Power transfer as a function of converter parameters
- Determination of Resonant current and switching currents of the semiconductors
- Soft-switching boundaries with respect to the gain and loading of the converter.
- Optimization of modulation strategy for partial-load operation.

A closed-loop simulation model for a 10kW SRC-DAB should be made in PLECS. The analytical calculations should then be compared with the simulation and measurement results with a 10kW prototype.

Forschungsschwerpunkt:

	viel	▲			wenig		viel	▲			wenig
Leistungselektronik	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bauelemente	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Simulation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Elektrische Antriebe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Regelungstechnik	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Energienetze	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Programmierung	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>