

Design and Optimization of Two-stage Output EMI Filters

With increasing switching frequency and high power density of Power Electronic (PE) devices, the power electronic systems have to be designed according to Electromagnetic Compatibility (EMC) standards for high frequency (HF) electromagnetic interference (EMI) noise emissions and susceptibility. From the EMC point of view, these disturbances may cause significant problems for the normal working operation of the electronic devices. Electromagnetic interference (EMI) problems originate from an inadequate PCB layout, components' parasitic and mutual electromagnetic coupling effects among others. Power electronic systems need EMI filters in order to meet the EMC standards. The parasitic elements of the components, mutual couplings among components of the EMI filter have an influence on its attenuation characteristics and other devices in near vicinity.

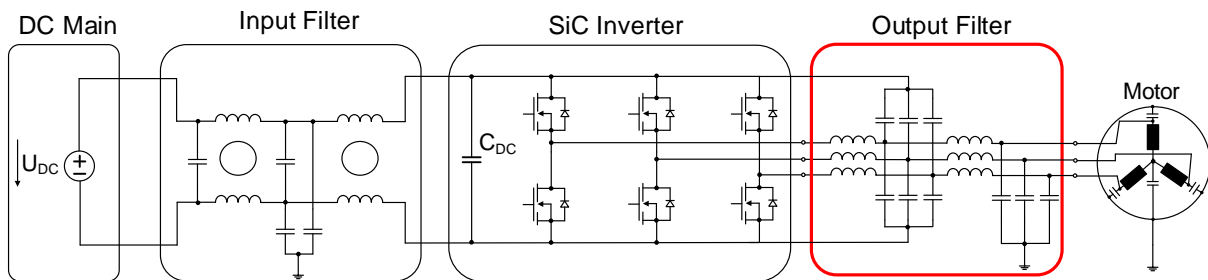




Fig. 1: A simplified system model of a drive system consisting of a two-stage output filter

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

The following tasks are offered:

- Draft of a size-optimized arrangement of the components and suitable PCB design
- Modeling the structure in 3D FEM
- Extraction of the parasitic elements and couplings, conversion into an electrical simulation and identification of the dominant couplings
- Creation of variants to reduce the dominant couplings
- study of the filter PCB design and the ground inductance

Forschungsschwerpunkt: Electromobility

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