Design and Development of an Active Output Filter for a High Performance Current Source [MA]

In the HPE Laboratory, a flexible high current source that is able to generate arbitrary current waveforms (e.g. DC, sinusoidal, step current waveforms) is under development. The current source is intending to push the boundaries of existing systems in terms of dynamic and ripple. In order to achieve this, a new active output filter stage needs to be developed, in order to ensure that the transient and steady state requirements are met for a wide range of different operating scenarios including unbalanced conditions.

This project focuses on the analysis, design and development of an active output filter. Initially, you will conduct the analysis and necessary simulations which will reveal the optimum component values in order to ensure that the specifications are met both when it comes to the transient as well as the steady state performance of the source. Afterwards, you need to design the dynamic current transformer that will ensure that the current ripple at the output of the system is accurately measured and transmitted to the master controller. Later on, you will be given the chance to design the active filter (PCB design and integration in the existing system). Finally, you will have the chance to implement the controller in VHDL and test the system in an existing experimental setup.

Outcomes: With this thesis, you will strengthen your analytical skills on power electronic, and get extensive hand-on experience with hardware design and testing.

Work Description (SA/MA):
- 30% Analysis/Optimization
- 50% Hardware Design
- 20% Controller Design

Prerequisites:
- Genuine interest for research in power electronics
- PCB design experience is considered a plus

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