

# Bachelor

## FPGA-based Converter Control and Optimization

### Motivation

Due to the advantages of parallel processing of Field Programmable Gate Arrays (FPGA), more and more FPGAs are used as the main control chip in grid-connected converters. With these FPGA, grid-connected converters can implement more complex algorithms in a shorter time. In this way, the new generation of grid-connected converters can perform more auxiliary operations for the power grid, e.g. active filtering, flexible alternative current transmission and even communication-based converter control.

### Research question (s)

In our PHIL laboratory there is a converter based on an FPGA controller. Now in the lab we can control the converter by giving instructions to the commercial FPGA controller via the host PC.

Based on this, the project should complete the new hardware design of the FPGA controller, writing the FPGA code and software for host PC to achieve and optimize the control of the converter.

### Procedure / Methodology / Task

Do some or all of the following tasks:

- Based on the existing measurement board, the design and welding of the new board should be completed.
- Based on the existing communication code, the communication between the measurement board and the FPGA board should be improved.
- The basic control algorithm should be understood.
- Discretize the existing control algorithm and convert it into a program suitable for the FPGA controller. The programming of FPGA can take on a graphical user interface or a code form.
- The design and programming of the Host-PC should be completed.
- Hardware-in-the-loop tests should be performed on the controller and the converter.

### Organizational matters

**Start immediately.**

### Contact person / supervisor

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