P-HIL Simulation for Hardware Testing in Grid Connected Converters

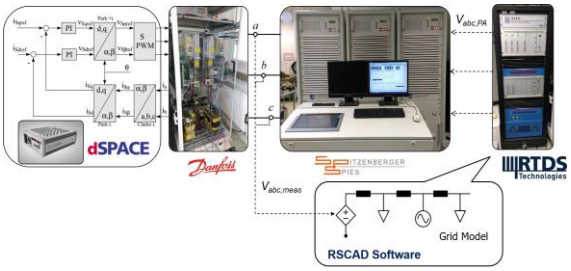
Christian-Albrechts-Universität zu Kiel
Technische Fakultät

Master's Thesis

Contact: Sante Pugliese
Email: sapu@tf.uni-kiel.de

Prof. Dr.-Ing. M. Liserre

Abstract– Modern energy systems are characterized by a wide adoption of power electronics interfaced generation and loads. Hardware performance validation is a fundamental step before its commercialization and installation into the grid. Power hardware in the loop (P-HIL) is a powerful tool for effective testing of power converters in simulated grid conditions. P-HIL simulation should be accurate to truly reflect the behavior of the systems under test, however it may result in errors or even instability. A systematic definition of the accuracy is crucial for comparing and selecting the proper P-HIL design in power system real-time simulation.



Background– The goal of this work is to investigate the accuracy of several interface algorithm for P-HIL simulation in grid connected converters. The definition accuracy based on the concept of emulated real-time grid impedance at the point of common coupling (PCC) is the main mathematical tool for accuracy investigation. The stability of the different P-HIL algorithms can be analyzed by using the impedance-based stability criteria with Nyquist/Bode in different grid scenarios. Implementation of a P-HIL test bench for grid connected converters with RTDS real-time simulator is essential requirement for achieving the main goal of the thesis.

Objectives:

-Accuracy in several interface algorithms for grid connected P-HIL simulation;

- Implementation of a P-HIL test bench for grid connected converters with RTDS real-time simulator;

-Implementation of a measurement routine for P-HIL grid impedance estimation.

Type of the Work:

- Theoretical analysis
- Real-Time Simulations\Laboratory

Language of the Thesis:

- English

Connected Project:

Add -ON