imperix

Written by: nicolas.cherix@imperix.ch
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PUBLIC DOCUMENT

INTERNSHIPS AND RESEARCH PROJECTS

Written by: Imperix ltd, Rte. des Ronquos 23, 1950 Sion, Switzerland
Addressed to: Any R&D-performing academic institution or industrial company

APPLIED PROJECTS IN POWER ELECTRONICS

CONTROL OF A DOUBLY-FED INDUCTION GENERATOR (DFIG) FOR WIND TURBINES

Motivations: Develop application examples that demonstrate the capabilities of its digital controllers in various types of applications.
Objectives: Implement with the B-Box RCP a working example of a complete closed-loop vector control for an DFIG. This includes the coding of the converter control as well as its practical validation on a Hardware-In-the-Loop (HIL) simulator.
Level: For students with a strong background in power electronics. MSc level only.

FREQUENCY CONTROL FOR A NON-INERTIAL MICROGRID

Motivations: Develop examples of centralized and distributed control with multiple converters (e.g. 3x-5x TPI8032). Illustrate the usability of the OPC-UA library in Matlab.
Objectives: Implement and experimentally validate state-of-the art primary, secondary and tertiary frequency control on a laboratory-scale microgrid.
Skills: For students with a strong background in power systems. MSc level only.

DESIGN OF A GAN-BASED POWER MODULE PROTOTYPE

Motivations: Develop a use-case example of a custom PCB design and its operation with B-Box. Obtain an opportunity to benchmark state-of-the art semiconductors.
Objectives: Design, implement and qualify a half-bridge similar to existing modules, but using GaN semiconductors.
Skills: Prior experience with PCB design is highly desired.

LOSSES MODELING FOR IMPERIX POWER MODULES

Motivations: Improve existing PLECS simulation models with relevant data regarding conduction and switching losses. Add thermal modeling.
Objectives: Lead an extensive measurement campaign to precisely qualify existing modules.
Skills: Strong interest for laboratory work and measurement in general.

DESIGN OF A HARDWARE TEST-BENCH FOR A POWER ELECTRONICS CONTROLLER

Motivations: Facilitate the automated testing of hardware and software with the B-Box RCP.
Objectives: Develop an equivalent controller as the B-Box, but with exactly opposed I/Os (ADCs become DACs, inputs become outputs, emitters become receivers, etc.)
Skills: Prior experience with PCB design is highly desired.

MICROCONTROLLER-BASED REAL-TIME SAFE-OPERATING-AREA MONITORING

Motivations: Adapt the maximum current of imperix power modules as a function of the operating voltage and switching frequency.

Objectives: Replace the existing combination of 2x MCUs + 1x CPLD with a single microcontroller that embeds logic functions (typ. PIC16F13145).

Skills: Prior experience with microcontrollers is needed. BSc and MSc levels suitable.

ISOLATED POWER SUPPLY FOR POWER ELECTRONIC MODULES

Motivations: Develop auxiliary power supplies for imperix power modules that withstand an isolation that is compatible with medium voltage applications.

Objectives: Design, implement and qualify a 12-to-12V, 12W supply with a 12kV isolation.

Skills: Prior experience in both power electronics and PCB design is highly desired.