

## 150 KVA Multifunction Laboratory Test Unit Based on Power-Frequency Converter

**Authors :** Bartosz Kedra, Robert Malkowski

**Abstract :** This paper provides description and presentation of laboratory test unit built basing on 150 kVA power frequency converter and Simulink RealTime platform. Assumptions, based on criteria which load and generator types may be simulated using discussed device, are presented, as well as control algorithm structure. As laboratory setup contains transformer with thyristor controlled tap changer, a wider scope of setup capabilities is presented. Information about used communication interface, data maintenance, and storage solution as well as used Simulink real-time features is presented. List and description of all measurements are provided. Potential of laboratory setup modifications is evaluated. For purposes of Rapid Control Prototyping, a dedicated environment was used Simulink RealTime. Therefore, load model Functional Unit Controller is based on a PC computer with I/O cards and Simulink RealTime software. Simulink RealTime was used to create real-time applications directly from Simulink models. In the next step, applications were loaded on a target computer connected to physical devices that provided opportunity to perform Hardware in the Loop (HIL) tests, as well as the mentioned Rapid Control Prototyping process. With Simulink RealTime, Simulink models were extended with I/O cards driver blocks that made automatic generation of real-time applications and performing interactive or automated runs on a dedicated target computer equipped with a real-time kernel, multicore CPU, and I/O cards possible. Results of performed laboratory tests are presented. Different load configurations are described and experimental results are presented. This includes simulation of under frequency load shedding, frequency and voltage dependent characteristics of groups of load units, time characteristics of group of different load units in a chosen area and arbitrary active and reactive power regulation basing on defined schedule.

**Keywords :** MATLAB, power converter, Simulink Real-Time, thyristor-controlled tap changer

**Conference Title :** ICPEE 2016 : International Conference on Power and Energy Engineering

**Conference Location :** Rome, Italy

**Conference Dates :** September 15-16, 2016