Technical Specification

Test Facility 1. Power Electronics Laboratory -PEL

The Power Electronics laboratory is equipped with physicals models of different type electrical energy converters and the measurements apparatuses for his investigations: AC/DC, DC/AC current or voltage inverters, DC/DC converters, Active power filters, Digital oscilloscopes, Power Quality Analyzer, Simulation Software, Control Systems, Computer systems for modeling the power electronics devises. Wind generator physical model stand is realized.Experimental wireless inductive system for electric vehicles batteries charging is installed.

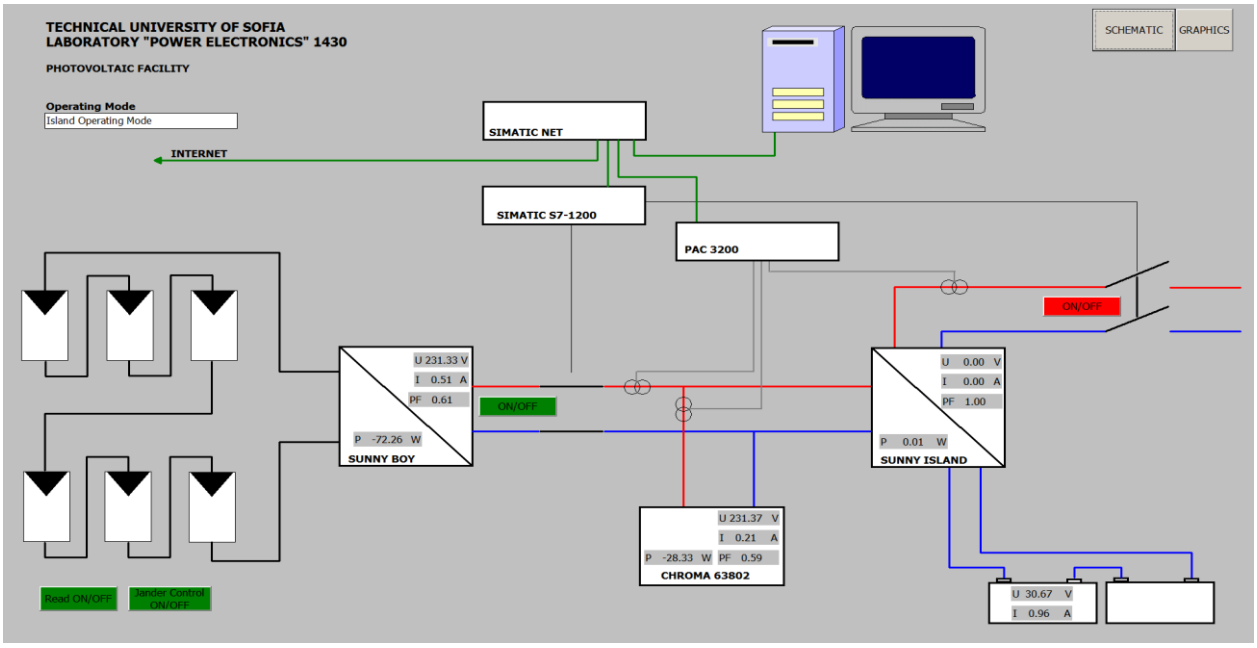
Installed **Hybrid installation** consists of a LV microgrid, Including, two SMA inverters, storage, controllable AC loads Chroma AC 63802, monitoring with Internet connection, Network connected and Island operation, SCADA and SIMENS PLC based Control System.

Proposed services:

- Research of methods and models for distributed systems with improved power factor relatively the electrical network:

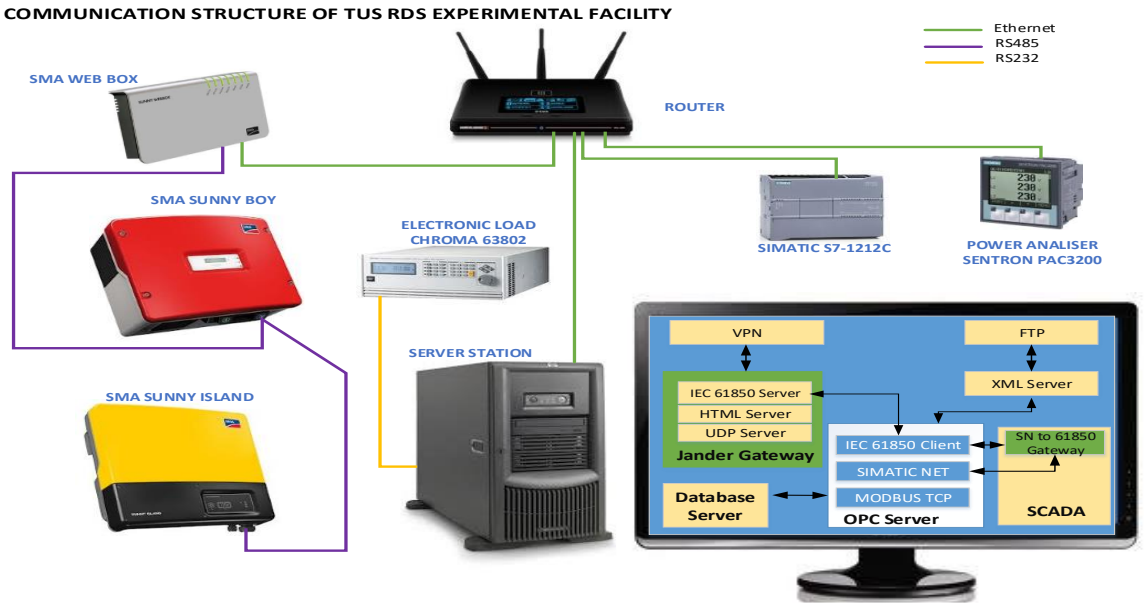
Research on network connected to the grid and Island operation in hybrid installation whit controllable loads and storage.

- Research on power flow in the hybrid system – steady state applications.
- Investigation and implementation of Active Power Filters for improvement of Power Quality and Energy Efficiency.
- Computer aided design and simulation with MATLAB, PSIM, PLECS and OrCAD Design Centre of DC/DC, DC/AC and AC/AC converters.

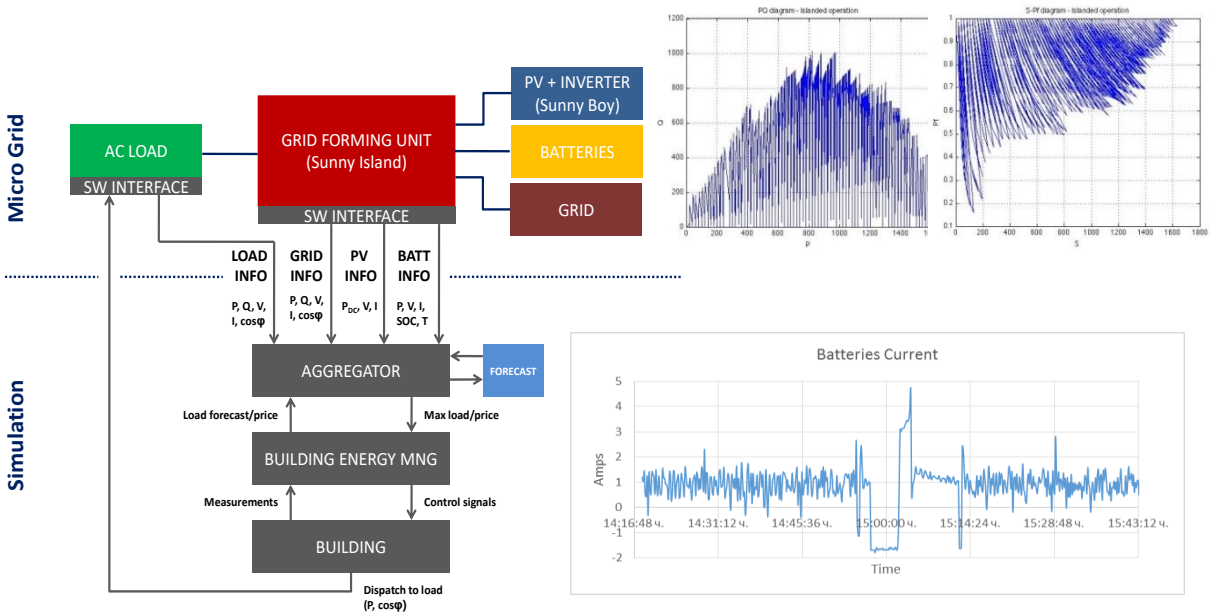


Six PV units Sharp NT175; PV inverter SMA Sunny Boy 1200, SMA Sunny Island 2224 (grid-forming); Batteries CSB GPL121000 (12V, 100Ah); Controllable load Chroma AC 63802; Windows-based computer

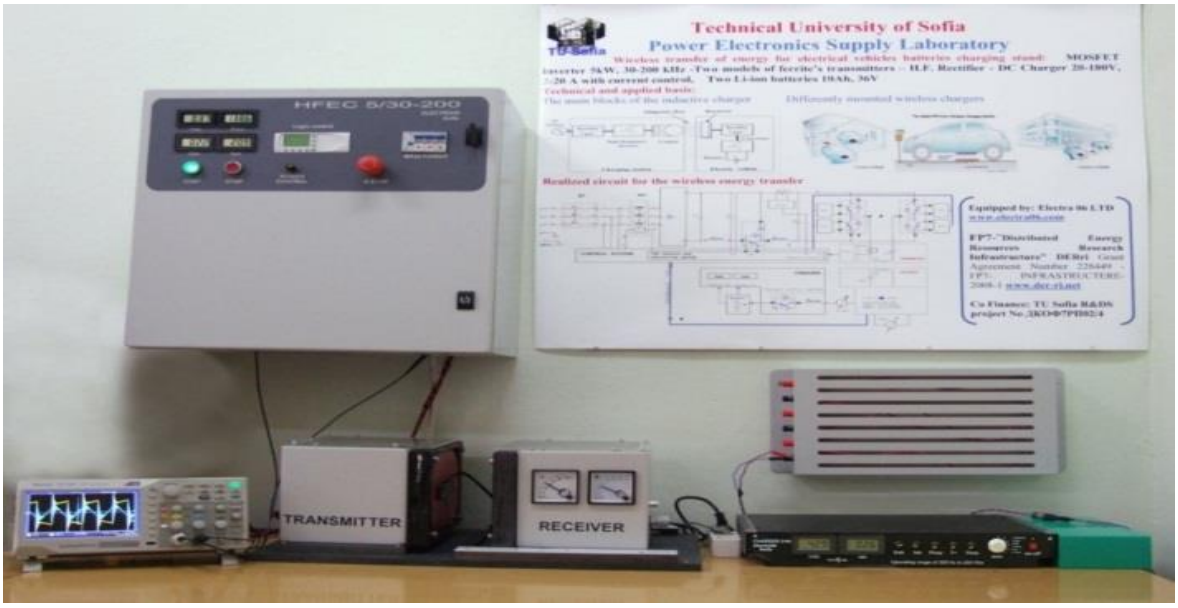
with Internet connection. SCADA control system and electrical connections remote monitoring and control of microgrid regimes were realized. Experimental regimes: Normal Operation Mode (grid and PV are connected) – NOP; Grid Operation Mode (without PV generation) – GOM; Island Operation Mode landed, with PV generation) – IOM; Batteries Operation Mode (islanded, without PV generation) – BOM. JaNDER Gateway is installed in TUS-RDS PEL ensuring connection using IEC 61850 client and/or Web Browser.



Microgrid remote control and testing under FP7 DERri project
"Transnational Access" –"Smart Buildings and Renewable Energy Integration in Micro Grids"



Experimental wireless inductive system for electric vehicles batteries charging

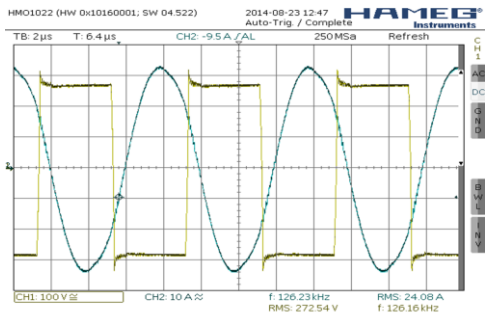


Parameters accepted for the complex system:

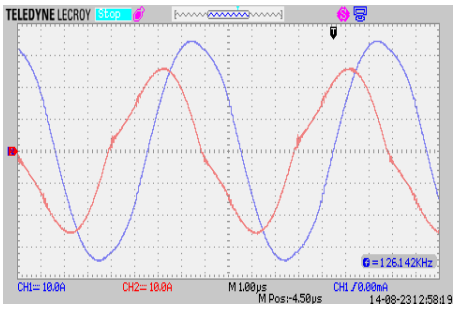
- Rectifier DC/DC Switch k=t/T=0,25-0.9;
- HF inverter 5kW, 30-200 kHz;
- Transmitter - Ferrite's "Sender-Receiver' with 5-150 mm distance;
- HF Rectifier and DC charger 20-180V, 2- 20 A with current control;
  - Load resistors 5-150 Ω ;
- Two li-ion batteries 10Ah, 36V;

The inverter is series resonant with sinusoidal current in exit circuit and rectangular voltage. The control is "Zero Voltage Switching" with minimalized losses of MOSFET switches and high efficiency. The synchronization of the inverter control is realized with measurement of current and voltage phases in the limits of nanosecond.

Inverter output voltage and current for P_{dc2}=5kW and Δ =40mm.



The currents of sender and receiver coils for P_{dc2}=5kW and Δ =40mm



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