

Research in the Department is focused on the development and experimental validation of new state of the art power electronic converters for such demanding applications as rolling stock, automotive, telecom and renewable energy systems. Key research directions include synthesis of new converter topologies, development of special control and protection algorithms, implementation of new components and elaboration of design guidelines to further improve the efficiency, power density, reliability and flexibility of the on-market power electronic converters. Other research activities are concentrated on the development of power flow control algorithms and new supervision, fault detection, protection and communication methods for the electronic power distribution networks (Micro- and SmartGrids)

Key Research Fields & Competence Areas:

- *Research and development of power electronic converters and auxiliary systems for rolling stock applications:*
 - Traction and auxiliary converters for light rail vehicles
 - High-voltage IGBT based converters for electric and diesel-electric locomotives and/or trains
 - Remote control, diagnostics and data communication systems
- *Research and development of power electronic converters for renewable energy systems:*
 - Power conditioning units for fuel cells and solar panels
 - Integrated multiport converters for hydrogen based long-term energy storages
 - Power electronic transformers (solid state transformers)
 - Interface converters for small- or medium-scale wind turbines
- *Research of advanced converter topologies (Z-source converters, high gain step-up converters, etc.) and state of the art components (SiC and GaAs diodes, planar magnetics, high-voltage IGBTs, etc.)*

Departmental Highlights:

- *Well experienced and dynamic team of young researchers and engineers*
- *Long-lasting experience in applied design of power electronic converters for different power ranges and applications*
- *Strong relations and cooperation with Estonian and Baltic industrial companies*
- *Strong relations with European universities and research institutions*
- *Modern laboratory facilities and infrastructure:*
 - Small-scale Microgrid with alternative and renewable energy sources for research and teaching
 - Fast prototyping tools for speedy assembling and experimental verification of new ideas and concepts
 - EMC laboratory
 - Up-to-date simulation tools
- *Project-based PhD programs with research oriented theses*
- *Active participation in EU funded programs and joint research projects*



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