



The research at the Power Electronic Systems Laboratory (PES) addresses challenges that have a fundamental or generic nature. The focus is on ultra-high switching frequency and highly compact PWM converter systems where the considerations are on a system-oriented basis and proposed concepts should allow a translation into future innovative industrial products. Converter topologies, modulation schemes, control, and EMI are seen as coupled issues rather than treated in a sequential manner. Circuit-oriented simulation and finite-element-based analysis of the electromagnetic and thermal behavior are integrated into the research and design process. The main areas of research are currently

- novel concepts of PWM rectifier systems with low effects on the mains,
- novel AC/AC PWM sparse matrix converter topologies,
- highly compact electromagnetically integrated DC/DC converter systems,
- bearingless motors and ultra high speed drives, and
- multi-domain multi-scale modeling, abstraction and simulation.

In each research area a comprehensive experimental verification of the proposed theoretical concepts is provided that employs the latest Si and SiC power semiconductor and digital signal processing technology. The investigations are currently carried out by 28 Ph.D. students and 4 Postdocs under full or partial funding by international industry partners.