

Universität Stuttgart Institut für Elektrische Energiewandlung

Magnetic und Thermal Simulation and Measurement of Coil Topologies for Transcutaneous Inductive Energy Transmission

A significant application of inductive energy transmission is the supply of cardiac support systems in a 5-20 W range. Currently, the energy and data transmission of these implants are realized by a cable leading through the abdominal wall to the outside placed controller and batteries. The aim of our research is to replace the conductive connection by a transcutaneous inductive transmission path. This will reduce the patients' risk of infection and improve their quality of life.

Regarding system design, the best locations for placement of a secondary coil in the human body have to be found. Both the self-inductance of the coils and their thermal losses per unit area should be considered. It is important that the guidelines for electromagnetic fields near living beings are observed.

In the student work, selected coil topologies are to be modeled with the multiphysics software COMSOL in a first step. They are to be analyzed with respect to given boundary conditions.

In a following work step, the considered coils should be practically built up and measured regarding electrical and thermal properties.





Student profile:

MA

- → Self-reliant working attitude and own initiative
- → Basic knowledge in electromagnetics
- ightarrow Interest in the area of thermodynamics
- \rightarrow Knowledge or interest in FEM modelling
- \rightarrow Practical skills
- → Basic knowledge in CAD-Modelling desirable

Aufgabenbeschreibung:

- → Introduction in COMSOL Multiphysics (physics environments, modeling, ...)
- → Modeling of defined coil topologies with corresponding electromagnetic properties
- → Numerical simulation of the topologies with respect to self-inductance and thermal losses in a selected frequency range
- \rightarrow Setup of relevant coil topologies in practice
- → Measurement with respect to transmission efficiency as well as thermal losses
- → Comparison of simulation and measurement results
- ightarrow Documentation and written elaboration

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