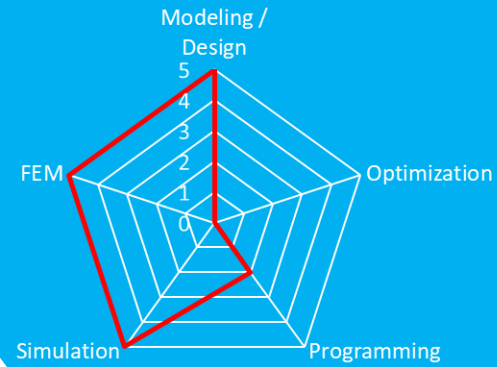
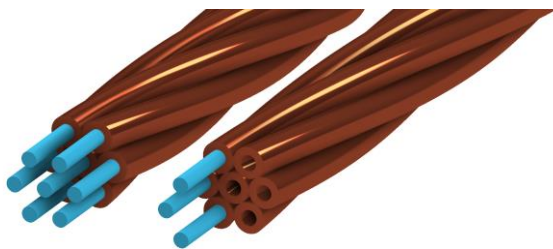




## Investigation of the Potential of Hollow-Conductor Cooling for WPT Systems

WPT systems for automotive applications are already commercially available and, according to the SAE J2954 standard, achieve charging powers of up to 11 kW. Further increases in power are limited by growing space requirements and increased thermal loads. One possible approach for active heat removal is the use of hollow conductors through which a dielectric coolant flows, enabling cooling directly within the current-carrying conductor. This cooling technology is already used in electrical machines and allows current densities of up to 80 A/mm<sup>2</sup>.

The objective of this student project is the simulation-based investigation and comparison of a conventional litz-wire coil system with a coil system based on actively cooled hollow conductors for a power level of 11 kW. The focus is on electromagnetic and thermal simulations including loss modeling, the analysis of current density distribution, and the evaluation of the potential for increasing power density while considering fluid-dynamic requirements.



### Students Profile:

- Master's student in electrical engineering, mechanical engineering, or FMT
- Experience and strong interest in FEM modeling of WPT systems or electrical machines
- Basic understanding of electromagnetic loss models
- Fundamental experience with fluid-dynamic problems and heat transfer
- Experience with MATLAB
- Interest in COMSOL

### Tasks:

- Literature review on WPT systems and hollow-conductor cooling
- Definition of uniform boundary conditions
- Electromagnetic and thermal modeling of a conventional WPT system
- Modeling of a hollow-conductor-based WPT system
- Analysis and comparison of both systems, including current densities and power losses
- Assessment of the potential for power increase