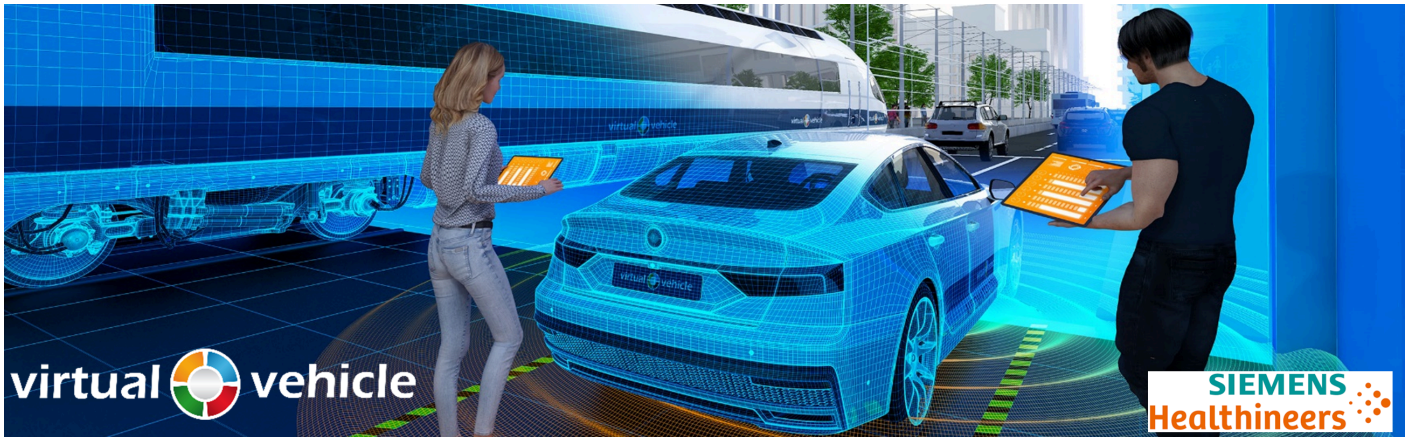

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Dissertation

VIRTUAL VEHICLE develops innovative solutions for the mobility of the future: reliable simulation technologies, software-defined systems, and data-driven applications. The focus lies on optimizing testing and validation processes in the automotive and rail industries, as well as increasingly in forward-looking sectors such as energy, maritime, defense, and health tech. With around 280 employees, the company is considered a key driver of innovation and an attractive workplace for highly qualified professionals.
SETLabs Research GmbH is a wholly owned subsidiary of Virtual Vehicle, specializing in the development of software systems and innovative cross-domain solutions applied in the automotive and rail sectors, and increasingly extended to fields such as robotics, logistics, energy, and healthcare.

Siemens Healthineers headquartered in Kemnath, Germany, the company is a manufacturer of medical technology and comprises the related activities of Siemens AG in this field. The main focus of development and sales lies on products for imaging diagnostics and therapy, in vitro diagnostics, as well as services in the medical technology sector.

As part of a long-term research collaboration, the research center offers the opportunity to pursue a PhD on the topic of **electrothermal cabling**. Academic supervision will be provided by partner universities. The PhD position is associated with a **50% part-time employment at the research center in Graz**; the project will be carried out in close collaboration with **Siemens Healthineers locations in Kemnath** and the **research center**.

Dissertation „Signal Integrity Cabling“

Analysis of Cable-Based Multiphysics Effects in Medical Devices

Active medical devices place high demands on safety, reliability, and regulatory compliance. Electrical cable systems play a central role in power supply, signal transmission, and system integration. Although often considered passive components, cables can significantly influence system behavior and safety due to electromagnetic interactions, parasitic coupling, and physical feedback effects.

Under realistic operating conditions—such as continuous operation, varying load profiles, and complex installation environments—cable systems can become a critical source of electromagnetic compatibility (EMC) issues, signal disturbances, and instabilities. In particular, the coupling of parasitic currents can impair signal integrity and lead to system malfunctions.

With the increasing use of imaging technologies and AI-based analysis systems, especially in automated and robotic applications, the requirements for data rates, bandwidth, and robust signal transmission are rising significantly. In this context, electromagnetic interference may lead to system shutdowns during ongoing procedures and therefore represents a direct risk to functionality and patient safety.

The aim of this PhD project is to develop a comprehensive understanding of cable-induced EMC and signal integrity phenomena. To achieve this, simulation, measurement, and system analysis will be combined, including the early assessment of cable routing in the digital mock-up as well as the targeted separation of power, signal, safety, and imaging data paths. The results are intended to directly contribute to the development of robust and safe medical devices.

Research Questions

- How do parasitic currents arise and propagate in cable systems of medical devices under realistic operating conditions?
- Which factors (e.g., cable routing, geometry, shielding) dominate EMC behavior and coupling effects within complex systems?
- To what extent do EMC effects influence signal integrity and data transmission in high-resolution imaging and AI-based applications?
- How do parasitic coupling effects impact the functionality and stability of automated and robotic systems?

- Which critical scenarios (worst-case operation) lead to unacceptable signal degradation or system shutdowns?
- To what extent can EMC and signal integrity issues be predicted using simulation in the digital mock-up during early development phases?
- Which measurement methods are suitable for capturing and quantifying parasitic effects in cable systems?
- How can EMC and signal zones (power, signal, safety, imaging data) be systematically assessed and structured to reduce interference?
- Which cable routing strategies (internal, external, hybrid) enable a robust, EMC-optimized system architecture?

Qualifications

- Master’s degree (MSc) in Telematics, Computer Science, Electrical Engineering, Physics, or a related field
- Basic knowledge of electrical engineering / electrical measurement techniques and numerical simulation (e.g., FEM, multiphysics)
- Interest in interdisciplinary topics (EMC, system effects)
- Experience with or willingness to engage in experimental work
- Interest in applied research and prototypical implementation in an industrial environment
- High level of initiative and an independent working style
- Ability to solve complex problems in collaboration with external partners
- Willingness to travel quarterly (approx. 10%) between Graz, Munich, and Kemnath to support knowledge transfer
- English and German at B2 level

What We Offer

- PhD position within a fixed-term employment contract

- Qualified supervision and the opportunity to combine theoretical knowledge with practical experience
- Diverse tasks in an international research center with strong application focus
- Interdisciplinary working environment with creative freedom and short decision-making processes
- Possibility of remote work and flexible working hours based on independent planning
- Flat hierarchies enabling responsibility and creative collaboration
- Individual development opportunities through workshops, training, and conference participation
- Welcome Day and structured mentoring program
- Sports and health activities (e.g., yoga, company runs)
- Regular company events

The minimum annual salary, depending on qualification and classification, is **EUR 45.783 gross (fulltime).** An **overpayment** is possible and depends on qualification and the present special experience.

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