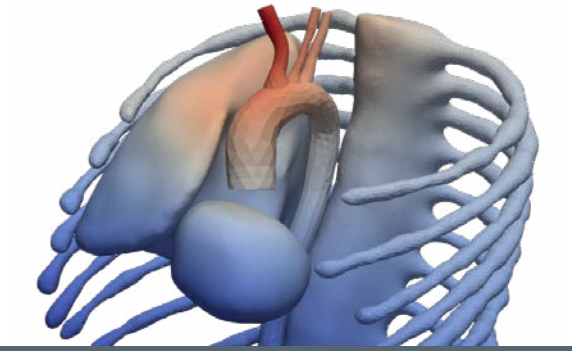
OPTIMIZATION AND INVERSE PROBLEMS



The optimization group of IGTE is focused on the development of deterministic, stochastic and hybrid methods for finding optimal designs in engineering. Furthermore, identification in biomedical engineering, high frequency applications and material science is subject of current research projects. We cordially invite electrical engineering, ICE and digital engineering students of all technical specialization subjects who like to make given designs more powerful to join our group.

TOPICS FOR STUDENT PROJECTS:

- Digital twins of human body segments for studying vascular diseases
- Material parameter identification of suspensions (human blood)
- Shape and topology optimization of electromagnetic devices
- Physics-based machine learning in optimization
- Surrogate-assisted optimization

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The Institute of Fundamentals and Theory in Electrical Engineering (IGTE) was founded in 1950 and has an outstanding international reputation in computational electromagnetics and multiphysics. We are working in the exciting area of modeling, numerical simulation and optimization of complex technical and medical systems ranging from antenna design, electromagnetic compatibility of electronic based systems, MEMS devices, sound design to medical applications such as human phonation and aortic dissection.

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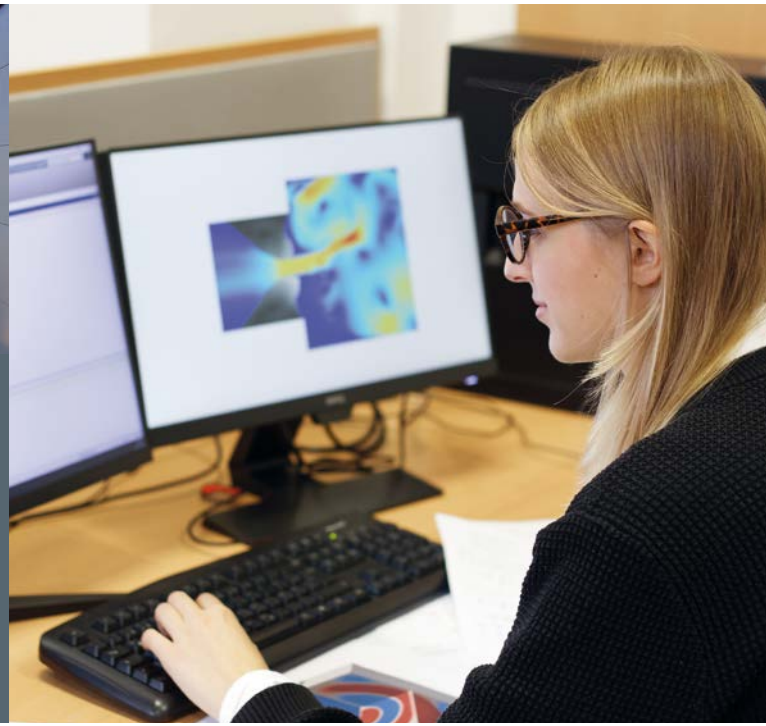
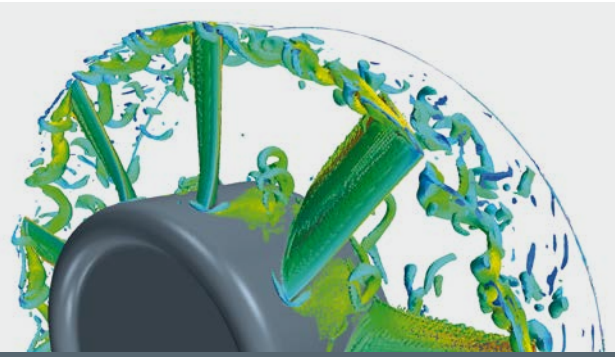


STUDENT PROJECTS

Institute of Fundamentals and Theory in Electrical Engineering

AEROACOUSTICS AND VIBROACOUSTICS



As part of an international project team, we develop solutions for noise reduction in electric mobility and medicine. Your project in acoustics adds value to your career as a complementary subject of electrical engineering. We encourage students in the specialization Audio Engineering and ICE to deepen their acoustic knowledge or programming skills while working with us in the acoustic group.

TOPICS FOR STUDENT PROJECTS:

- Modeling and simulation of the human voice
- Modeling and simulation of noise sources at electrified vehicles
- Development of a finite element software for wave propagation simulations
- Development of data driven simulation technology in aeroacoustic engineering and medicine

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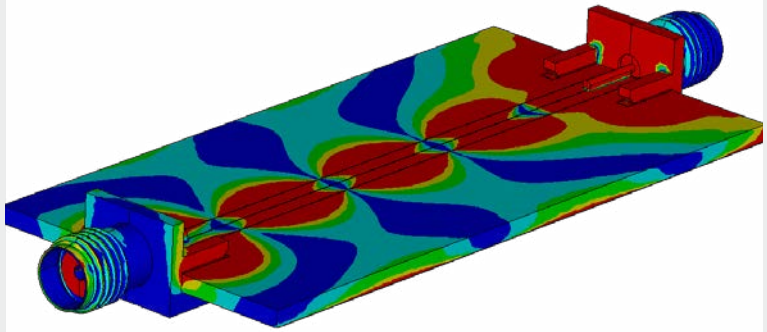
HIGH-FREQUENCY ELECTROMAGNETIC FIELDS



The HF (high-frequency) and EMC group (electromagnetic compatibility) is mainly active in the research areas antenna design and development of EMC aware models for HF components. Students in the specialization subjects Information and Communication Technology and Communication and Mobile Computing are encouraged to deepen their HF knowledge working with us in the HF & EMC group.

TOPICS FOR STUDENT PROJECTS:

- Modeling and simulation of antennas and antenna arrays
- Modeling and simulation of EMC and EMI behavior of HF components and measurement systems
- Numerical optimization of antenna structures
- Modeling and simulation of coupled field-circuit problems

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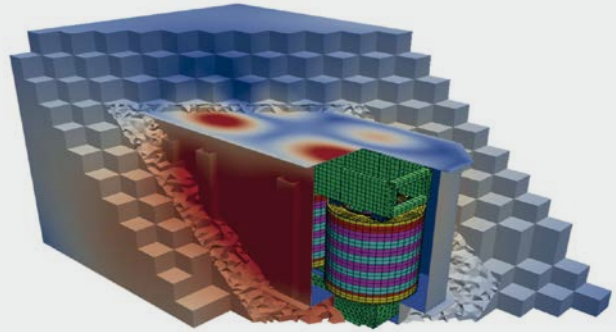
MULTIPHYSICAL MODELING AND SIMULATION



In the multiphysics group, we develop finite element simulation methodologies for various coupled problems and physical fields (induction heating, magnetic resonance tomography, MEMS loudspeaker, electrothermal simulations of power electronics). We encourage students form the different specialization subjects in electrical engineering, ICE and digital engineering to work with us.

TOPICS FOR STUDENT PROJECTS:

- Digital sound reconstruction using MEMS speakers
- Implementation of advanced finite element methods
- Modeling of hysteretic material behavior
- Development of simulation methods for power transformers
- Development of rotational single sheet tester for characterizing magnetic materials

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