

Impact of Alternating Electromagnetic Fields on High-Temperature Superconducting Coils for Application in Linear Electric Machines

Type: Master Thesis
Content: theoretical / simulative
Possible start: 01.04.2025
Key words: electric machines, high-temperature superconductors, simulations

TUM Hyperloop

Our group is researching Hyperloop technology for passenger transport. We focus on electromagnetic levitation, suspension, and propulsion, simulation of high-speed aerodynamic phenomena, cooling systems, and vehicle structure and infrastructure topics. Depending on the topic, we work on new test benches and the implementation of various experiments, computationally intensive simulations, or the design of new types of components. Our chair aims to motivate you and other students to develop modern technology for tomorrow – together as a strong team with the power of everyone.

Job Description

Using high-temperature superconducting coils as rotors or excitation systems in electric machines offers huge advantages compared to conventional solutions based on permanent magnets. Here, we want to investigate the impact of an alternating electromagnetic field generated by a three-phase stator on high-temperature superconducting coils used as a rotor. With a simulation tool of your choice, e.g. COMSOL Multiphysics, transient and eddy current simulations are supposed to predict the behavior of the superconducting coils.

Your Tasks

- Understanding the characteristics of superconducting coils and their applications.
- Conducting complex electric simulations in finite element software.
- Design optimization to minimize electric losses.

Our Requirements

- Being familiar with working principles of electric machines and superconducting coils.
- Experience with or willingness to learn to operate new software.
- High motivation with enthusiasm to make an impact.
- Perseverance to finish tasks on time.

Our Offer

- Working with students and researchers in a highly motivated young research team.
- Experience in a new field of research which is gaining in importance.

Contact

If you are interested in working with our team, please send your application, motivational letter, and supporting documentation to Tim Hofmann (tim.hofmann@tum.de). If you have any questions, do not hesitate to contact us.