TUM Hyperloop
TUM School of Engineering and Design
Technical University of Munich

Modeling and Simulation of a Hybrid Electromagnetic Suspension System for a High-Speed Maglev

Type: Master Thesis
Content: theoretical
Possible start: April/May 2026

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

As part of the levitation subteam within the TUM Hyperloop team, you will be working alongside motivated students and researchers on our site in Ottobrunn. Your responsibility will be to investigate various modeling and simulation approaches for a Hybrid Electromagnetic Suspension (HEMS) system used for a high-speed Maglev vehicle. HEMS refers to a concept where electromagnets are used in combination with e.g. permanent magnets that provide a constant magnetic field to reduce power requirements. Key characteristics of such a system include lift and drag forces as well as power consumption. The work will include the Finite Element Method (FEM), analytical models as well as conceptional ideas and recommendations for prototype design.

Your Tasks

- Gain a solid understanding of the fundamental concepts and operating principles of EMS and HEMS.
- Setup and analyze FEM models for a HEMS system
- Derive analytical models for a HEMS system
- Evaluate and compare lift capabilities, power consumption and geometrical factors of HEMS with standard EMS systems under various disturbances

Our Requirements

- Readiness to learn and understand a new complex research topic in a short time
- High motivation and willingness to make an impact
- Knowledge and experience in modeling and system theory
- Experience with Matlab/Simulink

- Preferably basic knowledge of Ansys Maxwell

Our Offer

- Working with students in a highly motivated young research team
- Getting experience in levitation system development and testing on a fantastic real-world problem
- Helping to shape the next–generation passenger transport system

Contact

If you are interested in working in our team, please send your application together with a motivation and supporting documentation to name surname (oliver.kleikemper@tum.de). If you have any questions, do not hesitate to contact us.