

## Student project proposal

### *Project title*

**Development of a time-dependent 3D FEM model for the analysis of a linear electric motor.**

*Project type*       MSc thesis       BA semester project       MSc semester project

### *Project responsible and e-mail*

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### *Project description*

The proposed project is part of the EPFLoop team's research into the propulsion of high-speed levitated vehicles. The homopolar linear synchronous motor (H-LSM) is a motor that can create both propulsion and levitation forces simultaneously.

The aim of this project is to build and simulate a 3D FEM model of a H-LSM to assess the performance in terms of thrust, levitation, and effects due to the motion of the motor. The model should be time-dependent to simulate transients and could use a moving mesh for the motion. The possible use of symmetries in the model will have to be studied and validated.

A good understanding of FEM solver's configuration and meshing methods is required, however, no need to be familiar with electrical machines.

The model will be developed on COMSOL Multiphysics, using AC/DC module and magnetic and electric field interface.

### *Tasks of the student*

- Get familiar with COMSOL interface.
- Build a 3D geometry of the motor (explore possible symmetries).
- Parametrize the mesh.
- Set up the studies.
- Configure the solvers.
- Run and validate the results.

### *Requirements*

- Finite element methods (FEM).
- Time-dependent solvers
- Moving mesh

### *Literature*

- [1] <https://www.comsol.com/acdc-module>