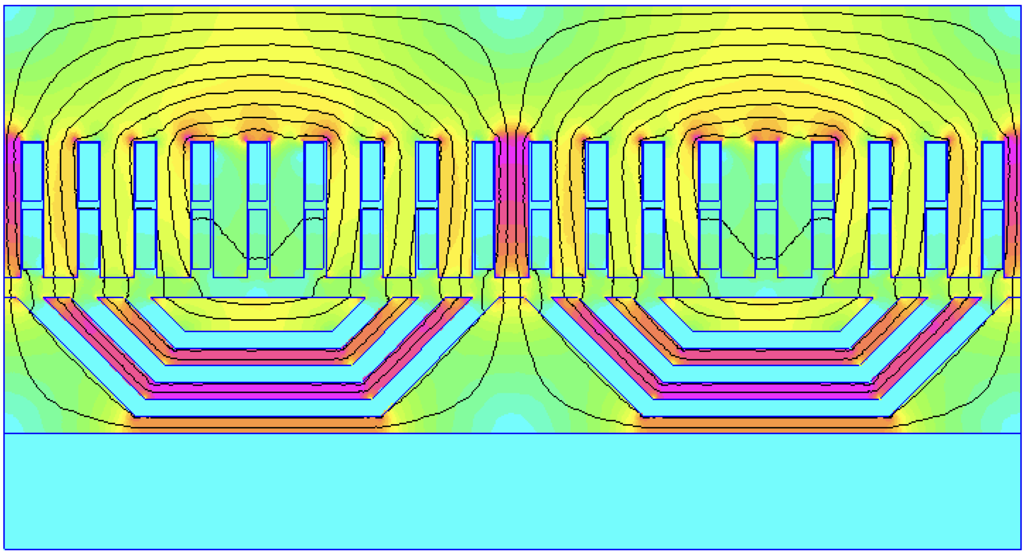
Synchronous Linear Reluctance Motor

Hyperloop technology relies on a linear motor to enable rapid transport in near-vacuum tubes. An efficient motor makes a major contribution to the development of an economically feasible system.



Simulation magnetic flux density of an example

Dimensioning and Inductance

To analyze the synchronous linear reluctance motor, a calculation script in Octave was developed. It enables the determination of inductances, including the main inductance, which are essential for evaluating the machine's electromagnetic behavior. These values form the basis for further optimization and rotor design.

Rotor Design and Simulation

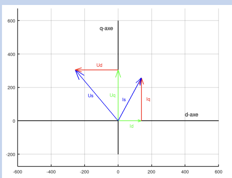
A suitable rotor concept was created and modeled. Using FEMM, the magnetic flux distribution and force interactions were simulated under three-phase excitation. These simulations help verify the inductance results and provide insight into flux paths and the mechanical forces acting on the mover.

Optimization

Based on the first results, the rotor geometry was optimized to increase performance and efficiency. At the same time, the Octave script was refined to run more efficiently and to generate reliable data for iterative improvements of the design.

Power Factor

The power factor is crucial for efficiency and system integration. Although the motor delivers sufficient force, the power factor remains too low for industrial use, making its improvement a key task for future development.



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