

SUGGESTED TOPIC FOR SCIENTIFIC WORK

Characterization and Measurement of Parasitic Capacitances in PMSM Motors





The objective is to characterise and measure parasitic capacitances in a Permanent Magnet Synchronous Motor (PMSM). High switching speeds in modern inverters cause capacitances between the stator, rotor and windings, leading to common-mode currents, electromagnetic interference (EMI) and high-frequency voltage changes.
These effects can also cause shaft voltages and bearing damage through electrical discharges. As inverter switching frequencies increase, understanding and reducing these effects becomes increasingly important for improving motor performance and reliability.
The topic is merely a suggestion and must be finalised with the institute.

Tasks:

- Develop a high-frequency equivalent circuit model for our custom PMSM architecture.
- Evaluate how these measured capacitances influence system-level EMI and bearing wear within the specific context of our Formula Student race car.
- Research current literature on high-frequency effects in electric machines and established methodologies for measuring parasitic capacitances

Requirements:

- Currently enrolled in a related engineering field at the University of Stuttgart.
- Experience in MATLAB/Simulink or other similar simulation tools.
- Team-spirit and good communication skills in German or English.