



Master Thesis Proposal: **Advanced Loss Modelling of Electrical Machines for Automotive Applications**

Number of students: 1

Subject: **Electrical Machine Design & Modelling**

Thesis description:

As the automotive industry is rapidly electrifying the vehicle fleets around the world, the demand for high efficiency powertrains is becoming more important. Polestar Performance AB is now developing their own powertrains for their top of the line high performance vehicles and is therefore investing significant resources into developing new state of the art electrical machines. In this project, new methods for evaluating the electromagnetic losses in electrical machines will be developed with the aim of providing fast and accurate loss estimations accounting for PWM effects, manufacturing effects and end-winding losses.

The work will entail simulation of electrical machines using JMAG simulation software in which different loss calculation methods are to be developed, tested, and evaluated. Simulations will be conducted both in 2D and 3D where the methods are to be compared in terms of simulation accuracy, speed & simplicity. In addition, tests may be carried out on a physical electrical machine to evaluate the PWM effects and the same method is also to be implemented in and compared.

The work will be conducted over a period of 2-month internship combined with a 6-month thesis for a total of 8 months accumulated work. The work will be conducted on site at one of the Polestar offices, either in Gothenburg or Trollhättan (Sweden).

Polestar expects that the student applicant has excellent academic results and previous experience with working with electromagnetic FEA solvers. In addition, the student must be fluent in English (Writing & Spoken).

Supervisor(s): Andreas Carlsson, Viktor Josefsson

Software: JMAG, Python, Matlab, Simulink