MITSUBISHI ELECTRIC R&D CENTRE EUROPE

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Internship proposal M/F (6 months)

Soft magnetic materials for power electronics

(JMR092019)

Supervisor

Mitsubishi Electric R&D Centre Europe: Julien Morand, Researcher j.morand@fr.merce.mee.com

Background

MITSUBISHI ELECTRIC R&D CENTRE EUROPE (MERCE) is the European R&D centre from the Corporate R&D organisation of MITSUBISHI ELECTRIC. The aim of our centre is to provide advanced R&D support to the Japanese R&D centres and to the business units of MITSUBISHI ELECTRIC CORPORATION.

Situated at the heart of Europe's leading R&D community, MERCE includes two entities: MERCE-France and MERCE-UK, and conducts R&D into next generation communication systems and technologies related to Energy and Environment. MERCE is reinforcing its activities with regards to high density and integrated power converters. Magnetic devices (inductors, transformers) are key elements that occupy a significant volume in a power converter. By using an innovative soft magnetic material, the core can be shaped into more complex shapes and optimize the manufacturing cost. Novel technique of production such as additive manufacturing and/or hybrid manufacturing can be explored to obtain optimized shapes. This will open up new possibilities in integrated power converter packaging and assembly. In previous work, the manufacturability and some electrical and thermal characteristics of soft magnetic materials have been investigated.

Internship description

The objective of this internship is to determine the loss characteristics of soft magnetic materials which are temperature and frequency dependent. In order to achieve this mission, it is required to prepare a characterization test bench equipped with excitation and sensing capabilities. Some block functions have already been developed by MERCE team members. In order to characterize the material, realization soft magnetic test samples will also be asked.

Internship organisation

The internship will take place at MERCE, located in Rennes, and will entail the following steps:

- Survey on soft magnetic material and magnetic loss measurement;
- Prepare loss measurement test bench;
- Prepare soft magnetic material samples by using classical or innovative manufacturing techniques;
- Generate the frequency and temperature dependent loss characteristics;
- Compare different soft magnetic material types and fillings
- Project report and presentation

Prerequisites

- Student with electrical engineering background with interest in research;
- A basic understanding on magnetic materials and magnetic devices (inductors, transformers);
- Strong interest in experimentation, and familiar with electrical engineering lab equipment;
- Autonomous ;
- Team player;
- English: spoken / written.

Duration: 6 months

Internship starts: as soon as possible (can be flexible, depending on the school)

Contact: Magali BRANCHEREAU (jobs@fr.merce.mee.com)

Thank you to provide us an application letter and your CV mentioning the reference of the internship *JMR092019* (both in PdF versions).

The signature of an Internship Agreement with your school is mandatory.