

## ***Internship proposal M/F (6 months)***

Soft magnetic materials for power electronics

(RMR062018)

### **Supervisor**

*Mitsubishi Electric R&D Centre Europe*: Roberto MRAD, Researcher [r.mrad@fr.merce.mee.com](mailto:r.mrad@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 soft magnetic materials, the magnetic devices can have more complex shapes and lower manufacturing temperature and cost. This opens 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 produce the loss characteristics of soft magnetic materials which are temperature and frequency dependent. In order to achieve this task, it is required to prepare a characterization test bench equipped with excitation and sensing capabilities. It is also required to design and manufacture soft magnetic test samples. Once the measurement campaign is completed, it is required to verify the obtained loss characteristics under real switching conditions. Finally, these tasks are to be applied on different soft magnetic material types and filling percentage.

### **Internship organisation**

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

- Survey on soft magnetic material and magnetic loss measurement;
- Prepare loss measurement test bench;
- Prepare soft magnetic material samples;
- 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;
- Strong understanding of 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.mercede.mee.com](mailto:jobs@fr.mercede.mee.com))

Thank you to provide us an application letter and your CV mentioning the reference of the internship *RMRO62018* (both in Pdf versions).

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