

Postdoctoral Position (M/F)

Mechatronics Researcher – Design of Axial-Flux Electrical Machines Using PCB Technology

(12 months, reference DITFT061)

Context and Responsibilities

MITSUBISHI ELECTRIC is a key player in the field of power devices, ranging from semiconductor components to systems such as HVDC equipment. As a subsidiary of the Mitsubishi Electric Group, MITSUBISHI ELECTRIC R&D CENTRE EUROPE (MERCE) has a research entity based in Rennes (France, Brittany [35]) specialized in Power Electronics, with a strong focus on PCB based heterogeneous integration and its applications to electrical machines, both radial and axial flux. To increase the technology readiness level (TRL) and promote its integration techniques at the scale of a complete electromechanical conversion system, MERCE plans to develop prototypes of axial-flux machines equipped with PCB stator windings.

Within this framework, MERCE is recruiting a postdoctoral researcher specialized in Mechatronics. The main responsibilities will include :

- Identifying, based on literature survey and existing products, the fundamental characteristics (torque, speed, number of poles, etc.) of an axial-flux machine intended for electric mobility (electric vehicles, eVTOL aircraft, etc.).
- Generating, using a in-house developed pre-design tool, Pareto fronts to identify potential solutions with high torque and power density. This study will be based on standard PCB stacks.
- Modelling the selected structures using 3D Finite Element Analysis (FEA) software to validate the performances and confirm the pre-design phase. This step will also help clarify constraints applied to the inverter driving the machine.
- Bridging the gap between theoretical design and practical implementation limits. Identifying and considering manufacturing constraints and their impact on motor design to finalize selection.
- Identifying external partners for the manufacturing and assembly of sub-components (PCB, mechanical parts design, magnet procurement, machining, etc.).
- Supervising the production of components manufactured by external entities as well as the assembly of sub-systems.
- Experimentally validating the prototype to obtain targeted performance indicators by implementing test benches at MERCE or collaborating with external partners if technical constraints cannot be met internally.
- Writing technical reports to monitor project progress.

The results of the research activities will be eligible for publication in international conferences and peer-reviewed journals.

Candidate Profile

- PhD in Mechatronics or Electrical Engineering, with a focus on rotating machine design.
- Research experience in a public laboratory or private R&D environment.
- Strong knowledge of Mechatronics: fundamental structures of radial flux machines (RFM) and axial flux machines (AFM), design elements (winding strategies, copper and iron losses calculations, cooling).
- Experience in motor prototype design and mechanics topic; ability to adapt theoretical motor designs to real mechanical constraints. Experience in drafting design drawings is a plus (SolidWorks, AutoCAD, etc.).
- Proficiency in scientific computing software (MATLAB) and circuit simulation tools (PSIM, PLECS), along with solid experience in 2D/3D Finite Element software (FEMM4.2, Maxwell 2D/3D).
- Theoretical knowledge of power converter topologies (three-phase inverters or more) used with rotating machines and their experimental implementation.
- Experience in a laboratory environment, including the use of power equipment (power supplies, loads, control units), electrical measurement tools (oscilloscopes and probes, impedance meters), mechanical measurement devices (torque meters, encoders, speed sensors), and thermal measurement instruments (thermocouples, optical fibers, IR cameras).

Personal Skills

- Autonomy, strong organizational skills, and rigor to meet commitments
- Motivation to work in a multicultural environment
- Good interpersonal and adaptability skills
- Strong analytical and communication abilities
- Team-oriented mindset with a proactive approach
- Fluent English

Duration : 12 months (with a possible extension of up to 24 months under a postdoctoral contract)

Contact : Magali BRANCHEREAU, HR Manager (jobs@fr.mercede.mee.com)

Please send your application (CV and cover letter in PDF format), indicating the job reference.