ICT PHD

Research project for a PhD curriculum in ICT – Computer Engineering and Science/Electronics and Telecommunication/Industrial Applications of ICT

**Tutor**: Giovanni Franceschini

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**Proposed Title of the research:**

Novel high performance electric motors by means of additive manufacturing and innovative materials

**Keywords: (5)**

**Electric motors, additive manufacturing, high performance electric drive, green transition, energy efficiency**

**Research objectives: --(max 10 rows)**

Additive manufacturing allows a new approach to the design of electric machines, new kind of motor topologies moreover new materials can be employed to overcome the state of the art.

The objectives of this research project are:

* Characterization and research of new materials for magnetic circuit and windings
* Developing a new approach to the electric machine design without the limitation of the planar symmetry
* Identify the critical design issues with additive manufacturing for windings and magnetic circuit
* Developing new magnetic model for the new motor design

**Proposed research activity -- (max 10 rows)**

The research activity targets a groundbreaking innovation in the design and manufacturing of electric machines (EMs) by a combined action on: i) the adoption of novel architectures through the exploitation of the design freedom enabled by additive manufacturing processes (AM); ii) the capitalization of the inherent anisotropy of layer wise construction for the achievement of direction-specific electrical and magnetic properties; iii) the optimization of the metal microstructure, as a result of a specific tuning of the additive process parameters, targeted to an ameliorated hysteresis behaviour. In the long-term, the above approach will result in a new generation of EMs, with improved efficiency reducing, at the same time, the raw material consumption grasping the object of a new level of sustainability. In general, the research will lead to major innovation in the field of EMs design and AM of ferromagnetic materials, which are still in the initial stages of development.

**Supporting research projects (and Department)**

**The successful candidates will become part of the MeltingLab and Raw Power research team, The candidate will be involved in the developing of R&D research for some important industrial application in the fields of electric machine and drives.**

**Possible connections with research groups, companies, universities.**

Raw Power is a member of the high technology network of Emilia Romagna Region, Raw Power is also a design centre of ST microelectronics and is involved In the YesVGaN european project with other major companies and Universities in the field of electric drives and Power Electronics.

 (\*) optional

(\*\*) optional/to be completed on the second year