POLITECNICO DI MILANO

PhD in INGEGNERIA ELETTRICA / ELECTRICAL ENGINEERING - 38th cycle

PNRR_352 Research Field: EMC IN ELECTRONIC DEVICES FOR MEASUREMENTS AND PROTECTION IN LOW-VOLTAGE ELECTRICAL GRID

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The main motivations for this research activity are closely related to the process of **Digitization**, improvement of the **Energy efficiency**, and development of **Green Technologies**, thus being closely related to PNRR motivations and objectives, Mission 1 (Digitisation, Innovation, Competitiveness) and 2 (Green Revolution), respectively. Meters of electrical quantities, particularly electric energy consumptions, are necessary to implement energy efficient policies in a large wealth of applications, ranging from industrial installations, to buildings and commercial or residential installations.Currently, the development of new meters, embedding modern, digital resources, is hindered by electromagnetic compatibility issues. In practice, time and resource consuming trial and error approaches are used. In contrast, the possibility to qualitatively and quantitatively analyze high frequency electromagnetic phenomena would yield the quicker market release of products that may provide finer power quality reports, and more easily communicate with users throughout recent and diversifies protocols, aimed at a deeper integration with digital and comprehensive energy management ecosystems. Developing such knowledge is key to compete internationally in the dynamic and aggressive technological sector of energy. The research activity will focus on electromagnetic modeling and simulation aimed at understanding the coupling phenomena in low-voltage devices (energy and

	powermeters), with the objective to develop EMC prediction tools and tailored EMC testing procedures and setups.
Methods and techniques that will be developed and used to carry out the research	Methods and techniques include electromagnetic, multi-physics, circuit modeling [with emphasis on multi-conductor transmission line (MTL) theory], statistical techniques for EMC, measurement theory and techniques for EMC (EMC testing), modeling and simulation (at system, unit, device and component level) by means of mixed approaches, reduced-order techniques, model-parameters extraction from measurements, etc.. ABB will provide essential information on the design process of low-voltage devices, and will make available labs and equipment for experimental measurements.
Educational objectives	The aim is to form a highly qualified PhD candidate with wide and deep expertise in the field of EMC of energy systems, with the ability to face complex EMC/EM problems in real-life and diversified electronic and electrical products and applications.
Job opportunities	Successful fulfilment of the research program related to this Scholarship will provide the PhD candidate with the qualification required to seek employment as EMC expert in diversified companies active in the energy and electronic sectors, e.g. the industrial partner ABB (multinational company with various subsidiaries).
Composition of the research group	2 Full Professors 2 Associated Professors 2 Assistant Professors 4 PhD Students
Name of the research directors	Prof. Sergio Amedeo Pignari

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	0

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	ABB S.p.A.
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	This research project will foster collaboration with relevant international universities and research centers. The foreign institution will be selected during the 3 years research program in agreement with the industrial partner.
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities: Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentations and computer, etc. This amount is equal to 10% of the annual gross amount, for 3 years.

Teaching assistantship: Availability of funding in recognition of supporting teaching activities by the PhD student. Thereare various forms of financial aid for activities of support to the teaching practice. The PhDstudent is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability: individual use.

Desk availability: individual use.

Accommodation in Politecnico's Residences (http://www.residenze.polimi.it) is available for PhD candidates; special rates will be applied to selected out-of-town candidates (detailed info in the call for application).

Research period abroad: Our candidates are strongly encouraged (6 months minimum is mandatory) to spend a research period abroad, joining high-level, research groups in the specific PhD research topic, selected in agreement with the Supervisor. An increase in the scholarship will be applied for periods up to 6 months.