UNIVERSIDAD POLITÉCNICA DE MADRID

Expression of Interest – UPM Supervisor

Marie Skłodowska Curie Action –Postdoctoral Fellowship 2022 (MSCA-PF-2022)

Contact Person/Scientist in charge *(datos del IP del grupo de investigación o responsable científico)* **Name**	Miroslav
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Department /Institute /Centre *(datos del centro/departamento donde estaría ubicado el investigador a contratar)* **Name**	ETSI Industriales, Centro de Electrónica Industrial
Address	José Gutierrez Abascal 2
Province	Madrid
Research Area *(en base a las 8 áreas científicas establecidas en MSCA. Se podrán seleccionar entre una y tres áreas científicas por EOI)*	Information Science and Engineering (ENG)
Brief description of the Centre/Research Group *(Max. 1600 caracteres con espacio: información sobre el centro / grupo de investigación / personal científico, destacando los aspectos más relevantes de los mismos. Incluir URL si es posible.)*	The Centro de Electrónica Industrial (CEI) of Universidad Politécnica de Madrid (UPM) is a research center whose main fields of work are power electronics and embedded systems. The power electronics group is actively working on the topics of high frequency power conversion, solutions for renewable energy applications and power electronics enabling technology such as Wide Bandgap devices, digital control, high frequency magnetic modelling and design. The group is composed of four professors and in the recent years we have been very active in the field of Inductive Power Transfer, MHz GaN power converters and advanced optimization and design techniques that have resulted in journal publication, such as IEEE TPELS and IEEE JESTPE, and several technical tutorials at the most important conferences such as, IEEE APEC, IEEE ECCE Europe and PCIM. The center has an important infrastructure and available equipment for the successful realization of the research tasks: • Large Laboratory (200m^2) where full time researchers (Doctoral and Master) have assigned their own desk with computers and monitors. There are also 15 workbenches equipped with advanced instrumentation to test electronic circuits. • Medium Power Lab (50m^2) dedicated to power electronics projects. There are three-phase voltage sources (15kVA), Low and Medium Voltage DC power sources (up to 20 kW), electronic and passive loads, oscilloscopes, high precision power analyzer, Typhoon Hardware In the Loop, Impedance Analyzers, etc. http://www.cei.upm.es/people/faculty/miroslav-vasic/

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Project description *(Max. 1800 caracteres con espacio: breve descripción sobre el proyecto /línea de investigación en el que se acogería al investigador/a Marie S.Curie.)*	The primary aim of the project is to solve the problem of power electronics scaling via a new solution for galvanic isolation that is not based on the variable magnetic flux. At MHz operating frequencies the reduction of the magnetics size is impeded by the core power losses, decreased values of core permeability and its nonlinearity. Moreover, the parasitic elements seriously alter and impact their functionality. With the provocative driver idea of solid-state isolation, the project breaks with the conservative approaches to implement the voltage transformation and isolation. Avoiding magnetics, using the novel isolation approach in combination with advanced and customized thermal management will enable further frequency scaling. The magnetic free isolate power module will directly improve the energy and cost efficiency of DC multiport systems in Electrical Vehicle (EV) and Data Centers. We propose a radical paradigm change with the idea to empower the society with a highly efficient and integrable solution. In order to realize it, we will use modern GaN transistors as the technological platform to build a magnetic-free DC-DC Transformer and later integrate it in a DC Multiport system demonstrating the feasibility of this concept. Additionally, we will work on the novel solutions for the thermal management of GaN HEMT based power converters in order to extract their maximum performance by fabricating customized mini heat pipes of composite materials. The research will be built upon the following **three key innovation questions**: **1. *"How to implement effective galvanic isolation and voltage transformation without magnetic components?"*** **2. *"How to boost the GaN power converter thermal management?"*** **3. *"How to build a DC Multiport system using magnetic free DC-DC Transformer?"***
Applications: documents to be submitted and deadlines *(Indicar qué documentación deberá remitir el /la investigador/a interesado/a al centro para establecer el contacto: CV, letter of motivation, letter of references, etc., así como la fecha límite para el envío de la misma. Recomendado: Hasta finales de abril 2022)*	The candidates should provide their CV, a letter of motivation and a letter of references. **The applications should be sent by the 9th of May 2022**.