SPEAR Spin-orbit Materials, Emergent Phenomena and Related Technologies Training

We are currently looking for motivated PhD candidates to join SPEAR's training network!

The recruited early-stage researchers[1] (ESRs) will join **one of fifteen research projects** at SPEAR's academic or industrial partners in Spain, Switzerland, Belgium, France, Germany or Sweden.

Over the course of three years, the ESRs will research topics at the forefront of nanoelectronics and spintronics and benefit from a **comprehensive and intersectoral training program** including project workshops, special training sessions and participation in one or two secondments at host institutions for a total of 6 months[2].

Furthermore, they will be enrolled in the regular PhD programmes at a SPEAR beneficiary or partner organization and thus benefit from all local training activities and specialized courses.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement Nº 955671.

About SPEAR:

SPEAR's overarching scientific and technological goal is to study the rich physical phenomena observed in condensed matter systems with a strong spin-orbit coupling, and to build devices based on these phenomena for the **next generation of memories**. Indeed, Spin Orbitronics, as this field of research is called, has shown great potential for the development of **novel MRAM** (magnetic random-access memory) and is considered among the best strategies to complement and go **beyond current CMOS technology**, e.g., through spin-orbit-based logic, machine learning or neuromorphic computing.

Although the academic spintronic community is strong, the number of European companies taking advantage of spintronic technologies is still limited in comparison to those in the U.S. or Asia. SPEAR will bring together 7 universities, 3 research centres and 7 small and medium sized companies to set new ground-breaking scientific and technological objectives and to create a multidisciplinary network that will provide fifteen early-stage researchers with **quality training in the emerging field of Spin Orbitronics**.

[1] As defined by the European Commission for the context of MSCA-ITN project an early-stage researcher (ESR) is a researcher who is in the first four years of their research career.

[2] Due to the specificities of these two projects, IRP13 and IRP14 (see final section) have a single 6-month secondment.

SPEAR Spin-orbit Materials, Emergent Phenomena and Related Technologies Training

Application period:

March 1 – April 30, 2021
(evaluation on a rolling basis)

We are offering…

- A comprehensive and international training programme going beyond state-of-the-art spin-orbitronics

- Training in research-specific, complementary and soft skills, that involve both the academic and industry sectors and are tailor-made to prepare young researchers for their future careers

- A competitive salary, adjusted according to the host country

- A mobility allowance of 600€ and, if applicable, a family allowance of 250€ as part of the employment package

Eligibility Requirements:

The 15 researchers that will be recruited to work on SPEAR…

- may be of any nationality;

- must be proficient in written and spoken English.

At the time of recruitment (i.e. contract starting date) the researchers…

- must be early-stage researchers (ESR), meaning that they must be in the **first four years of their research careers** (full-time equivalent), i.e. four years or less must have passed since they obtained the degree which entitles them to embark on a doctorate;

- must **not** have been awarded a **doctoral degree;**

- must **not have resided** or carried out their main activity (work, studies, etc.) in the country of the host organisation for more than **12 months in the last 3 years.**

SPEAR Spin-orbit Materials, Emergent Phenomena and Related Technologies Training

Start Date:

Candidates are expected to start working on the project by September 2021. In some cases, an earlier starting date may be possible.

Selection Criteria:

- Academic record
- Scientific background
- Expected impact and benefits of the proposed training to the ESR's career

Available Research Projects:

For more information and to apply, visit **www.spear-itn.eu**

IRP	Host Institution	Title
IRP1	CIC nanoGUNE (Spain)	Graphene-based heterostructures for spin-orbit logic devices
IRP2	CIC nanoGUNE (Spain)	2D van der Waals magnetic heterostructures
IRP3	ETH Zürich (Switzerland)	Fast switching dynamics of three terminal magnetic tunnel junctions
IRP4	ETH Zürich (Switzerland)	Investigation of current-induced magnetic and spin-orbit effects in 2D materials
IRP5	IMEC (Belgium)	Exploration of new materials for reducing writing current of SOT-MRAM cells
IRP6	IMEC (Belgium)	Design-Technology Co-optimization techniques for enablement of MRAM-based Machine Learning hardware
IRP7	CEA (France)	Spin-charge conversion in topological insulators
IRP8	CEA (France)	Electric-field control of the spin-orbit conversion in Rashba interfaces
IRP9	Martin Luther Universität (Germany)	Search for efficient spin-to-charge conversion based on the Edelstein effect

IRP10	Martin Luther Universität (Germany)	Optimization of the skyrmion motion for racetrack applications
IRP11	Universität Hamburg (Germany)	Antiferromagnetic Skyrmions in ultrathin films
IRP12	Universität Hamburg (Germany)	Skyrmions in proximity to a superconductor with large spin-orbit coupling
IRP13	**QZabre (Switzerland)**	Skyrmions: Imaging and characterization at ambient conditions via scanning NV magnetometry
IRP14	**Antaios (France)**	Low current SOT-MRAM for integration in functional devices
IRP15	**NanOsc (Sweden)**	Voltage controlled operation and mutual synchronization of MTJ-based spin Hall nano-oscillator chains and arrays for neuromorphic computing

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For information on the 15 available research projects and to apply visit the project website www.spear-itn.eu!

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SPEAR is a European MSCA-ITN project funded under the European Union's Horizon 2020 research and innovation programme.

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SPEAR will bring together European universities (7), research centres (3) and SMEs (7) from Spain, Switzerland, Belgium, France, Germany and Sweden to set new ground-breaking scientific and technological objectives and to create a multidisciplinary network that will provide fifteen early-stage researchers with quality training in the emerging field of Spin Orbitronics.