Technology transfer

Exploiting its scientific results, inventions and expertise for the benefit of the industrial production system is one of SPIN strategic goals. SPIN scientists are routinely engaged in joint projects with industrial partners, carefully pursuing the protection of intellectual property rights. SPIN owns a set of **registered patents** of major industrial appeal, mostly in the fields of Biomedicine and Applied Superconductivity. A highly successful example of industrial exploitation of the scientific expertise derived from our research is provided by the spin-off company Columbus Superconductors, created by the collaboration with ASG Superconductors SPA and today world leader in the production of MgB_2 superconducting wires.

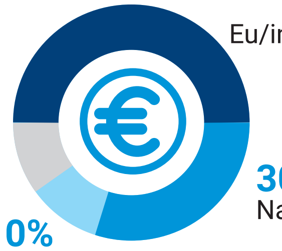
SPIN is actively engaged in several **public-private partnerships** targeted at fostering technology transfer to Industry: the most significant example is the recent START4.0 Competence Centre, aimed at applying Industry 4.0 enabling technologies for cyber safety and cyber security to the protection of strategic infrastructures of the Genoa area.

Outreach

SPIN has contributed, since the time of its foundation, to the organization of tens of national and international scientific conferences and workshops on different topics. The SPIN scientific community is specifically engaged, through the organization of schools, conferences and events dedicated to a broader audience, in a constant **education and dissemination activity** about the science and application of innovative materials.

SPIN researchers actively contribute to many dissemination events (e.g. European Research Night, Genova Science Festival, *Futuro Remoto*, etc.), enjoying the opportunity to present their **research activities** to a broader audience, often resorting to practical experiments mimicking real laboratory experiences. **Educational projects** have been recently established both for secondary school students (e.g. Work-linked training programs) and teachers (Courses on Small Physics experiments to be performed in classrooms). Starting from year 2019, a broad and comprehensive list of scientific seminars, conceived by SPIN scientists for students of different education level, is publicly available for presentation in Italian schools.

Facts and figures



Average amount of project funds per year
~2,5 M€

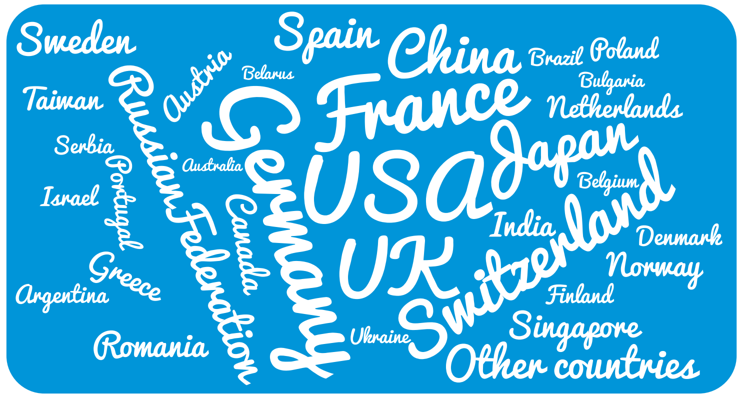
Average number of publications per year
275

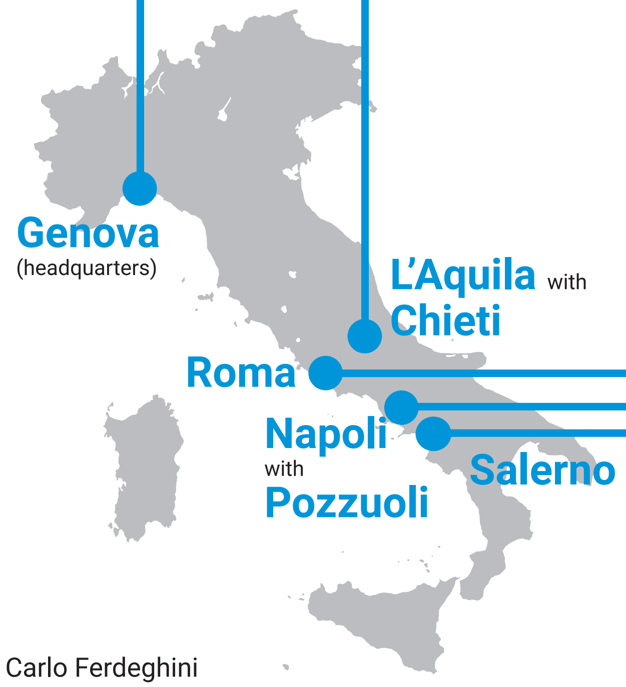
People

- **53** Researchers
- **72** Research Associates
- **35** PhD Students & Fellowships
- **18** Administration
- **10** Technical services

SPIN has branches and units located inside the **Universities**. Several Phd and master's degree students from Universities are **actively involved** in the SPIN research activities

International collaborations





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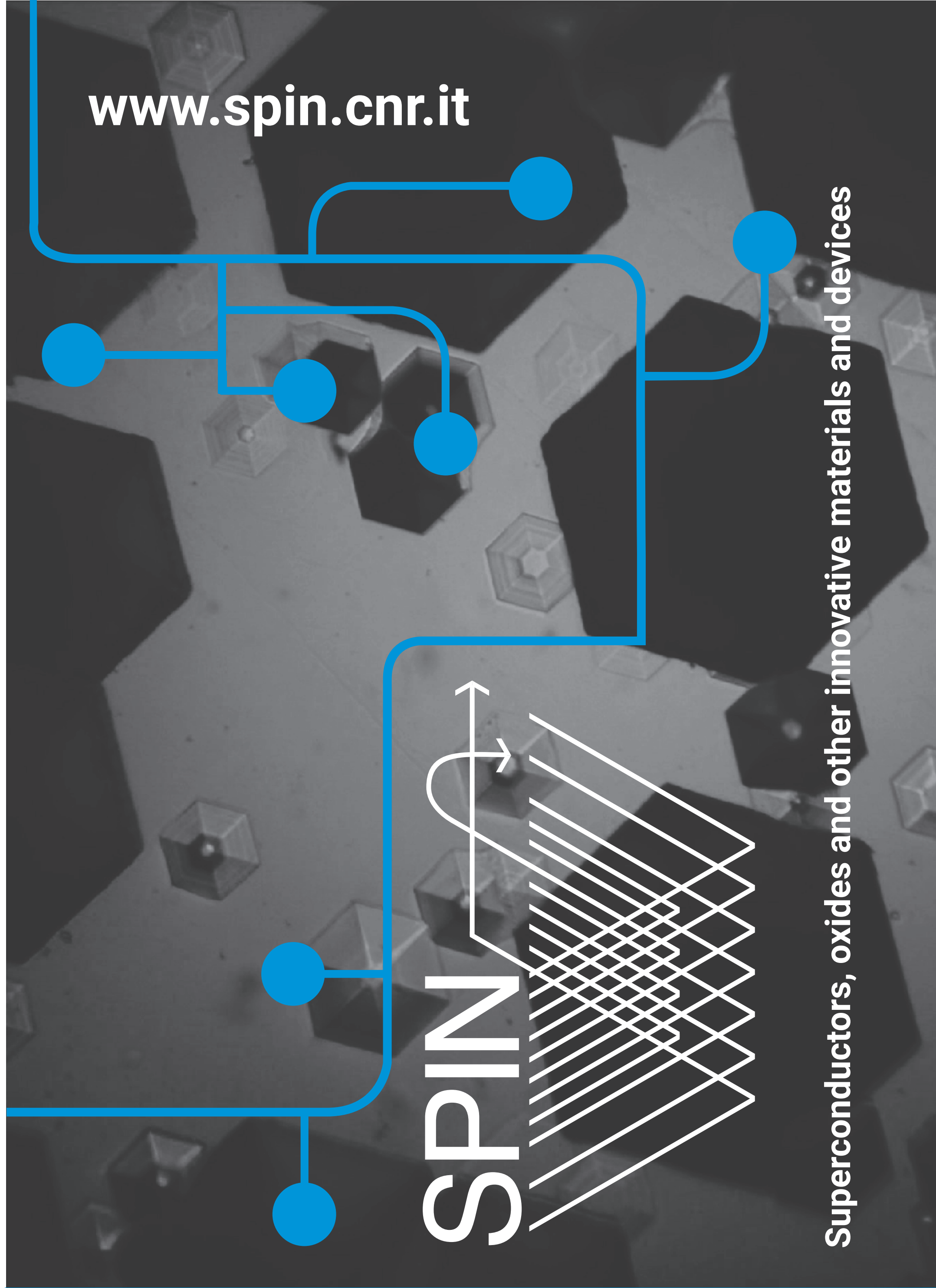


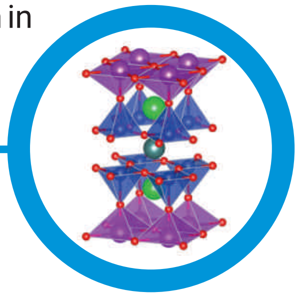
Superconductors, oxides and other innovative materials and devices

- Physics and applications of superconductivity
- Physics and applications of oxide, organic and low dimensional materials
- Synthesis and preparation of innovative materials
- Magnetic, transport and optical properties of materials
- Devices for electronics, energy and sensing
- Quantum technologies

National Research Council of Italy
Department of Physical Science and Technologies of the Matter

Mission and Organization

SPIN stands for **Su**Perconductors, oxides and other **IN**novative materials and devices. Its mission is the study of innovative materials and their application in the fields of electronics and energy.

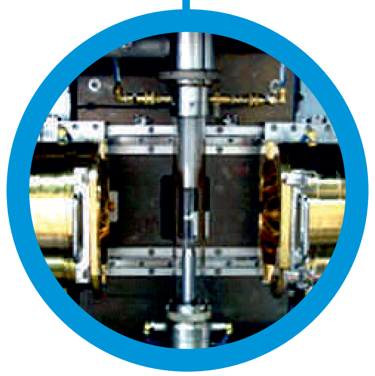


SPIN belongs to the **Department of Physical Sciences and Technologies of Matter** (www.dsftm.cnr.it) of the National Research Council of Italy (CNR).

Main equipment

SPIN instrumental endowment mostly covers the following areas:

- Thin film deposition
- Micro and nano-lithography
- Bulk material preparation
- Structural, morphological and chemical characterization
- Optical characterization techniques based on laser sources
- Magnetic, electrical and thermal characterization
- Cluster computing
- Cryogenics
- Scanning probe microscopy
- Mechanical deformation



Research activities

Activity A

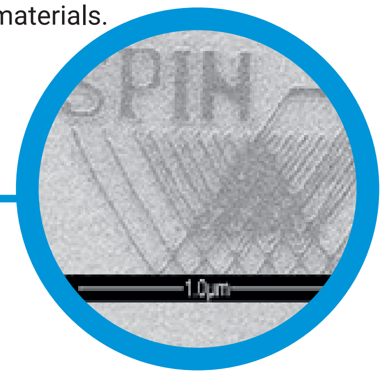
Novel superconducting and functional materials for energy and environment

This activity addresses the challenge to provide superconducting and innovative functional materials required for the transition to a sustainable energy system, i.e. to study materials for transporting, harvesting, converting and storing energy. The activities span from fundamental science to the realization of prototypal devices.

Activity D

Light-matter interaction and non-equilibrium dynamics in advanced materials and devices

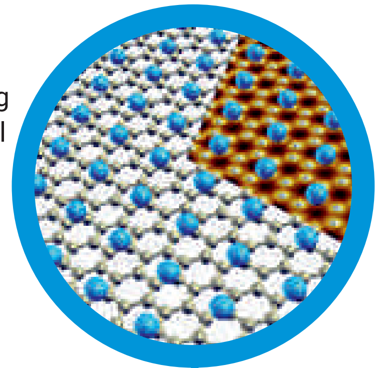
We study many phenomena and effects arising when light meets superconductors, oxides, non-linear optical materials and more. Understanding and controlling light-matter interactions opens the door to new functionalities and technologies such as novel quantum devices, components and light-driven micro/nano-structuring and fabrication. Our research spans quantum technologies, advanced sensing and metamaterials.



Activity B

Superconducting and correlated low dimensional materials and devices for quantum electronics and spintronics

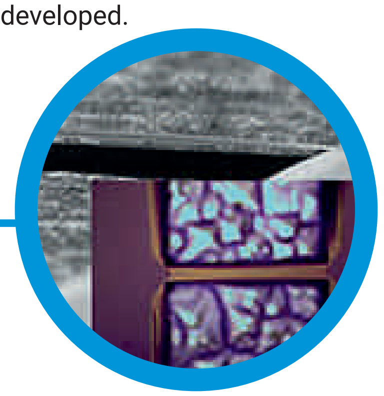
The general goal is to establish novel material platforms, devices and sensors in the fields of quantum electronics, quantum sensing and spintronics. To this aim, the activities include the fundamental understanding of the novel quantum physics in low-dimensional materials by combining theoretical and experimental approaches, from the advanced synthesis to the standard and advanced X-ray methods and to the realization of ultra-low temperature tunable nanodevices and sensors, based on Josephson junctions, novel field-effect transistors and novel magnetic materials. Among the main topics, we mention the metal and superconducting to insulating transition in low-dimensional materials, the unconventional superconductivity in 2D-materials, hybrid Ferromagnetic/Superconducting heterostructures and so on.

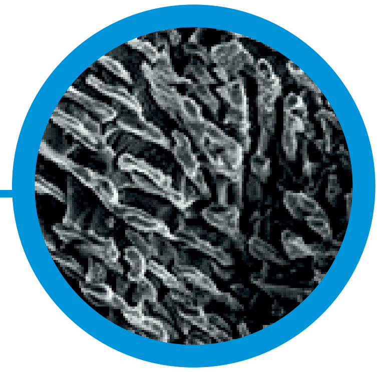


Activity E

Advanced materials and techniques for organic electronics, biomedical and sensing applications

This activity aims at investigating the properties of functional organic and inorganic materials of interest for the fabrication of innovative sensing, microactuator and electronic devices to be mainly applied in biomedicine and smart systems. New computational techniques, designed for processing large amounts of data produced by different and sophisticated diagnostic modalities, are also developed.





Activity C

Innovative materials with strong interplay of spin-orbital-charge and topological degrees of freedom

The research activity focuses on innovative materials with strong interplay of spin-orbital-charge-lattice and topological degrees of freedom, mainly driven by electronic correlations, spin-orbit interaction and their combination with quantum topology. Transition-metal-based systems (predominantly oxides) constitute our materials platform. The research activity rests on the synergy of accurate modelling, highly-controlled synthesis and advanced characterizations, in the final aim of finding the best candidates for new paradigms in emergent technologies, e.g. orbitronics, spintronics, magnonics, topotronics.

Activity F

Electronic and thermal transport from the nanoscale to the macroscale

The goal of this activity is to study, predict and design fundamental properties of novel functional materials, devices, and complex systems, with a main focus on (nano)materials for electronics, energy harvesting and conversion and on (quantum) phenomena where the interplay between different (electronic, vibrational, etc.) degrees of freedom as well as electronic correlations play a fundamental role.