UAM | IFIMAC Condensed Matter Physics Center | EXCELENCIA MARÍA DE MAEZTU

IFIMAC

CONDENSED MATTER PHYSICS CENTER

ACTIVITY REPORT

2024


UAM
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IfiMAC
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1 OUR CENTER

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IfiMAC
Condensed Matter Physics Center

Letter from the Director

Welcome to the annual report of the Condensed Matter Physics Center (IFIMAC). Established in 2012, IFIMAC's mission is to pursue cutting-edge research and scientific excellence in this broad field, at the crossroads of Physics, Chemistry, Materials Science and Biology, fostering a truly multidisciplinary approach. On April 1st 2024, IFIMAC started to develop the scientific project linked with its third consecutive award as a "Maria de Maeztu (MdM) research unit of excellence".

No other MdM center has accomplished this before, maintaining 10 years of recognized excellence since the first MdM call in 2014. This collective success rests both on the individual efforts of the IFIMAC researchers and staff and on their implication in the life of the center.

The ambitious goal of this project is to strength our scientific capacities and to foster our activity in areas of social impact like gender equality, outreach and knowledge transfer in order to prepare the center for an application to a recognition as a Severo Ochoa research center of excellence at the end of our current MdM project. On March 14th, just before sending this report to the print, IFIMAC has reached one of its strategic objectives: the Social Council of the Universidad Autónoma de Madrid (UAM), our hosting institution, has approved the creation of the IFIMAC Foundation. This new legal status comes together with the publication, on March 21st, of the open call for the construction of a brand new building for IFIMAC as part of a novel public-private partnership scheme. Both are key steps in the path to reach the status of a Severo Ochoa Center in the 2028 call.

IFIMAC membership is awarded to individual researchers, based on the scientific excellence achieved at the different levels of academic career. IFIMAC had 84 members in 2024, including 62 permanent research and teaching staff from UAM, 5 emeritus professors, two assistant professors and 15 young researchers associated with different programs of international talent attraction. These young researchers are supported by national (13 Ramón y Cajal contracts), regional (3 Atracción de Talento Comunidad de Madrid (AT-CM) modalidad 1). One of our young researchers has been granted an ERC Starting grant in the 2024 call. Work at IFIMAC is supported by a technical staff that included 2 IT and High-Performance Computing Infrastructure officers, 1 Laboratory Technician, 2 Project Managers and an Outreach technician. Apart from its members, IFIMAC hosted in 2024 the research activity and training of 24 post-doctoral researchers (58% of them, non-spaniards), and 90 PhD students. They contribute significantly to the achievement of the IFIMAC's mission.

Our research outcome in 2024 increases the total number of articles (202) and the publication in top-cited journals with respect to the previous year (37.25% in D1 according to WoS). A selection of papers highlighting the research activity of IFIMAC in key areas --spanning from Quantum Materials and Technologies, Nano and Quantum optics, and Nanotechnology, to Soft and Active Matter and Biophysics— can be found in section 4 of the report. Considering the end of the national calls for projects and infrastructure associated with the Next Generation Funds, IFIMAC researchers have continued to be very successful in the attraction of funding in 2024, with 152 active projects representing a total budget of 9.5 million €. It is worth noting the ability to attract funding from the EU through Horizon, ERA and ERC calls (18.0% of the total 2024 funding) with respect to previous years.

These research activities are complemented by the IFIMAC's involvement in training and outreach. We directly promote the Master in Physics of Condensed Matter and Biological Systems (*https://www.masternanobio.es*) and the PhD Program in Physics of Condensed Matter, Nanoscience and Biophysics (*http://doctorate-nanobio-uam.es*), and are involved in another three master and three doctoral programs at UAM. Our outreach activities cover from lectures for primary and high schools to promote STEM studies and scientific careers in the areas covered by IFIMAC, 26 technical seminars, to the monthly IFIMAC Colloquia. Among the outreach activities, I would like to highlight the third edition of the mentoring program for women physics students (with 41 women mentees and 41 mentors --with no gender restriction--) organized by the IFIMAC Gender Committee, and the consolidation of the IFIMAC Newsletter. This platform for sharing our activities within IFIMAC and with the broader Condensed Matter Physics Community is released twice a year and aims to strengthen the identity of our organization, and to provide regular updates on our achievements.

I invite you to explore this annual report and, through its pages, to discover IFIMAC's reality.

Rubén Pérez

IFIMAC Director

Overview

The Condensed Matter Physcis Center is a Research Center within UAM, located in the campus of the Universidad Autónoma de Madrid pursuing cutting-edge research and scientific excellence. It comprises researchers from several university departments aiming to advance the limits of knowledge in both theoretical and experimental Condensed Matter Physics. 62 researchers constitute its permanent staff with nineteen young resarchers (RyC, talent grant, Junior leader IFIMAC positions) and up to one hundred fourteen postdoctoral researchers and PhD students.

The IFIMAC – Condensed Matter Physics Center is a María de Maeztu Excellence Research Unit. The Center got the first Maria de Maeztu Excellence accreditation (MDM-20140377) on the 2014 call and it was renewed in 2018 (CEX2018-000805-M). The third María de Maeztu accreditation was evaluated during 2023 and awarded in April 2024 (CEX2023-001316-M).

Research performed in the institute has gained world reputation in the following areas:

- Advanced Materials
- First Principles Simulations and Modeling
- Nanophysics
- Nano and Quantum Optics
- Soft Condensed Matter and Biophysics

Research Lines

Resarch developed in the IFIMAC since it was set up in 2012 is organized in the following areas. Here we describe relevant general aspects of each line in the past years:

Advanced Materials

Today's devices and appliances require materials with ever increasing capabilities. Superconductors deliver considerable improvements in energy storage and transport and are fundamental in medicine for magnetic resonance imaging. Graphene and graphene-based materials promise to improve functionalities of many devices. New molecular systems are excellent sieves and are used in gas storage or photovoltaics.

IFIMAC works on the fundamental properties of materials with the aim to set the pace for future transformational changes in technology. For this, we carry an extensive research program in the synthesis, characterization, and modeling of new materials (Figure 1). We develop state-of-the-art instrumentation and techniques which we offer to other research groups through spin-offs or scientific collaborations. Among them are computational techniques as well as atomic manipulation and surface characterization techniques (Figure 2). IFIMAC takes full advantages of the possibilities offered by the UAM, leveraging the use of fabrication, nanofabrication (Figure 3) and characterization facilities of the Campus. The Helium liquefaction unit of the UAM is unique nation-wide and recovers and liquefies Helium for science, often also delivering

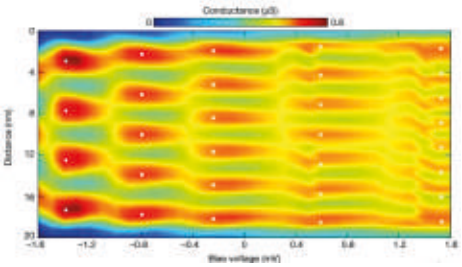


Figure 1: Conductance (color scale on the top) vs bias voltage (x-axis) and distance (y-axis) demonstrating lateral quantization of collective electronic states at the surface of the heavy fermion superconductor URu_2Si_2. Image taken at 100 mK. From ***Nature*** *616, 465 (2023).*

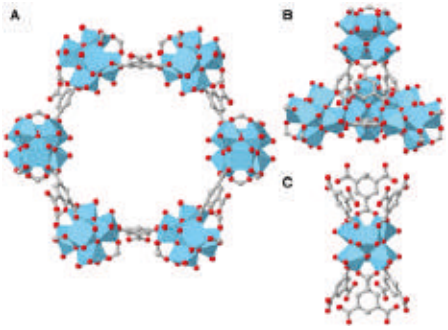


Figure 2: Hexagonal pore (A) and tetrahedral cavity (B) in the luminescent metal organic framework MOF-808, an emergent class of optical sensors. We show an unsaturated Zr_6O_8 cluster in C. Blue is Zr, grey is C and red is O, hydrogen is removed for clarity. From ***Nature Communications*** *14, 2506 (2023).*

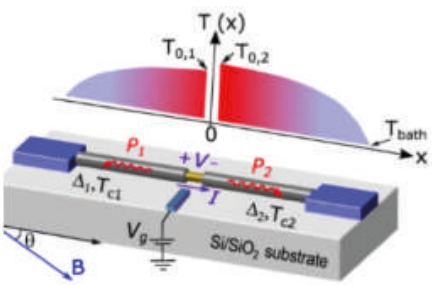


Figure 3: Device made of superconducting leads and a semiconducting nanowire. An etched part in the middle of the nanowire allows applying a gate. Heat flow (red lines) leads to a new characterization tool, Joule spectroscopy. From ***Nature Communications*** *14, 2873 (2023).*

industry. The fabrication facilities include state-of-theart machines, with a new metal 3D printer and a development center for new instrumentation. IFIMAC allows researchers to measure and characterize materials from atomic scale to large sizes, from low to high frequencies, at temperatures down to 7 mK and magnetic fields up to 22 T. IFIMAC includes the only laboratory contributing to the access system of a large-scale European infrastructure (the European high magnetic field laboratory), and collaborates very actively in synchrotron, neutron scattering and free electron laser facilities. Advanced calculations, from ab-initio to modeling, leverage experimental efforts in instrumentation to creating top level science. Practically any new idea in materials synthesis can be addressed at IFIMAC.

IFIMAC studies all sorts of topical quantum materials, obtaining advances in magnetism, superconductivity, topological properties of materials, interfaces, optical properties, electronics and spintronics, surface physics, molecular systems, graphene and other two-dimensional materials (Figure 4). Regarding the material properties under study at IFIMAC, several groups are very active in the research on magnetism, superconductivity, spintronics and vortex physics.

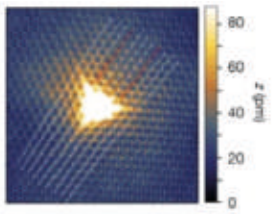


Figure 4: Friedel oscillations from H atoms in graphene. Additional wavefronts appearing due to dislocations are shown in red. From ***Nature****, 574, 219 (2019).*

First Principles Simulations and Modeling

Computer modeling has grown over the years into a scientific discipline on its own. Models are utilized to assess realworld phenomena maybe too complex to be analyzed in the laboratory or under hypotheses at a fraction of the cost of undertaking the actual activities. Models in industry, government, and educational institutions shorten design cycles, reduce costs, and enhance knowledge.

In Physics, the modeling of materials, through what is known as “first principles”, has become a major research field. By “first principles” one understands the use of the fundamental quantum mechanical laws of nature without any assumptions. The properties of the materials should emerge from the numerical solution of these laws. The models here are in fact a faithful representation of reality, but in a controlled environment. Researchers at IFIMAC have a long-standing and well-deserved international reputation on computer modeling and, in particular, on the development of efficient first principles codes for the simulation of the optoelectronic and structural properties of molecules, materials, and systems in general described down to the atomic level (SIESTA, ANT. Gaussian, FIREBALL, MOLCAS, EDUS, etc.). All the other research lines at IFIMAC benefit one way or another from this expertise. This knowledge not only benefits fundamental research, but can also be transferred directly into the society through spin-offs. IFIMAC researchers exploit these simulation codes to explore a wide variety of problems, including electronic transport, catalysis on reducible oxides and out-of-equilibrium electron dynamics.

Spin-dependent electronic transport is an essential feature not only in engineered devices for spintronics, but also in chemical and biological processes involving the propagation of a current through molecules. In recent years, it has been experimentally verified that an initially unpolarized beam of electrons will emerge polarized (in some cases, significantly) upon traversing a chiral molecule such as a DNA-like helicene; a realization of the so-called chiralityinduced spin selectivity (CISS) effect. In a recent article published in ACS Nano IFIMAC researchers show based on the use of representation theory within the scattering formalism for transport, that the appearance of such spin polarization is fundamentally allowed in a much wider family of systems, namely those that lack symmetry planes or axes containing the propagation direction (Figure 5). The role of the contacts is hence as qualitatively important as that of the molecules, to the point that the presence of the latter is not generally needed to observe spin polarization.

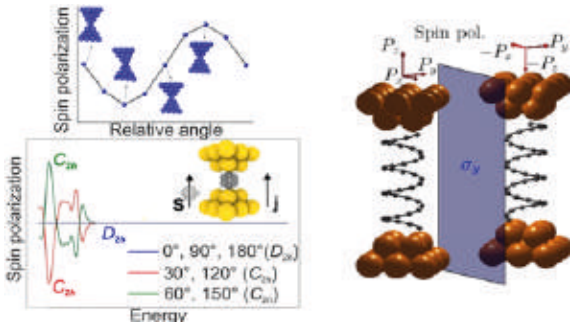


Figure 5: Different types of chiral systems such as those in the figure may exhibit the CISS effect. From ***ACS Nano****, 17, 6452 (2023).*

These predictions are illustrated by DFT calculations where they also show that the polarization vector is accompanied by a net spin accumulation in the system for finite bias, which may be detected in magneto-conductance setups.

Proteins are key biological molecules that are responsible for numerous energy conversion processes such as photosynthesis or respiration. In recent years, proteins have been investigated in a new setting, namely in solid-state electronic junctions, with the goal of understanding the charge transfer mechanisms in these biomolecules, but also with the hope of developing a new generation of bio-inspired nanoscale electronic devices. A new step towards this goal was reported in Angewandte Chemie by a collaboration between Weizmann Institute of Science (Israel)

and IFIMAC researchers. In this work, the authors show that a redox protein, cytochrome C, can behave as an electrically driven switch when incorporated in a solid-state junction with gold electrodes (Figure 6). By changing the external bias voltage in the junction, it was shown that the relevant molecular orbitals of the protein can be brought in and out of resonance with the chemical potential of the electrodes, which leads to the current switch behavior. Showing transition from off- to on- resonance can be very challenging and this is the first time it has been achieved for proteins within the same working junction. Extensive ab initio DFT calculations revealed that the charge transport proceeds through the heme unit in these proteins and that the coupling between the protein's frontier orbitals and the electrodes is sufficiently weak to prevent Fermi level pinning. The on-off change in the electrical current was shown to persist up to room temperature, demonstrating reversible, bias-controlled switching of a protein ensemble, which provides a realistic path to protein-based bioelectronics.

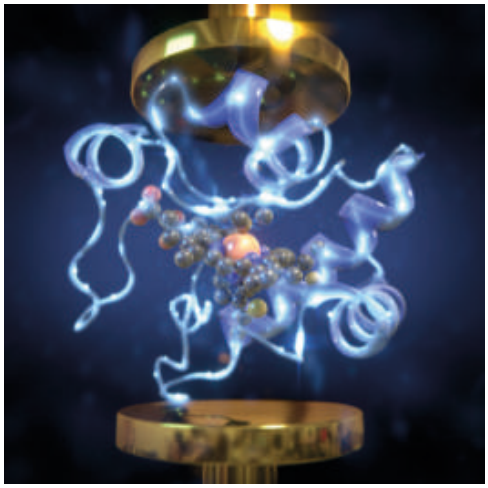


*Figure 6: An electrically driven switch can be formed by a cytochrome C monolayer, sandwiched between a gold layer and a gold nanowire. From **Angewandte Chemie**, 58, 11923 (2019).*

The unique catalytic properties of ceria for the partial hydrogenation of alkynes have been examined for acetylene hydrogenation (Figure 7). Catalytic tests over polycrystalline CeO_2 at different temperatures and H_2/C_2H_2 ratios reveal ethylene selectivities in the range of 75– 85% at high degrees of acetylene conversion and hint at the crucial role of hydrogen dissociation on the overall process. DFT is applied to CeO_2(111) in order to investigate reaction intermediates and to calculate the enthalpy and energy barrier for each elementary step.

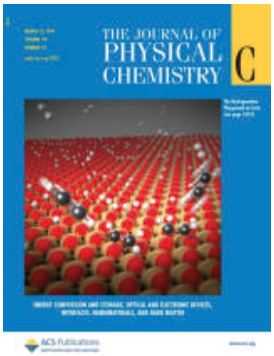


*Figure 7: Front cover artistic view of the catalyticprocess for acetylene hydrogenation. From **J. Phys. Chem. C**, 118, 5352 (2014).*

At a high hydrogen coverage, β-C_2H_2 radicals adsorbed on-top of surface oxygen atoms are the initial reactive species forming C_2H_3 species effectively barrierless. The high alkene selectivity is owed to the lower activation barrier for subsequent hydrogenation leading to gas-phase C_2H_4 compared to that for the formation of β-C_2H_4 radical species. These findings rationalize for the first time the applicability of CeO_2 as a catalyst for olefin production and potentially broaden its use for the hydrogenation of polyunsaturated and polyfunctionalized substrates containing triple bonds.

In a recent manuscript published in *the Journal of Chemical Theory and Computation* a collaboration of IFIMAC researchers have presented a theoretical framework and its numerical implementation to simulate the out-of-equilibrium electron dynamics induced by the interaction of ultrashort laser pulses in condensed-matter systems (Figure 8). Their approach is based on evolving in real time the density matrix of the system in reciprocal space. It considers excitonic and nonperturbative light–matter interactions. They show some relevant examples that illustrate the efficiency and flexibility of the approach to describe realistic ultrafast spectroscopy experiments. The approach is suitable for modeling the promising and emerging ultrafast studies at the attosecond time scale that aim at capturing the electron dynamics and the dynamical electron–electron correlations via X-ray absorption spectroscopy.

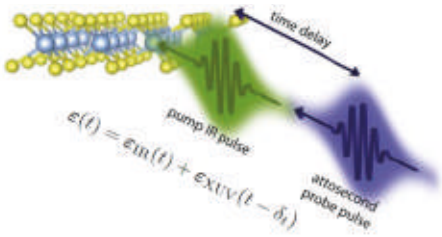


*Figure 8: Schematics of a pump-probe experiment where a first laser pulse excites the material while a second one explores the time evolution of the excitation. From **Journal of Chemical Theory and Computation**,19, 333 (2023).*

Nanophysics

When the characteristic dimensions of a system or a device are shrunk to the nanoscale, their properties change dramatically. The reason for that is that at this scale quantum mechanical effects set in, which leads to novel physical phenomena that, in turn, are often the basis of unforeseen technological applications. One of the main goals of researchers at IFIMAC is the study of the electronic, mechanical, thermal, and optical properties of structures and devices with nanometric dimensions, for which classical laws do not longer apply. For this purpose, we make use of a wide range of nanofabrication techniques, experimental probes, and theoretical tools.

Some of our main activities in the field of Nanophysics are related to the theoretical and experimental study of novel low-dimensional systems such as graphene and graphene-based nanostructures. Antimonene, a single layer of antimony atoms, was firstly obtained at IFIMAC. This 2D material is attracting much attention due to its strong spin-

orbit coupling and its potential in optoelectronics, thermoelectric applications, and biomedicine. This work was the result of an internal theoretical-experimental collaboration at IFIMAC, whose researchers are world leaders in this topic. Making use of experimental techniques such as Angle Resolved Photoemission Spectroscopy (ARPES) or Low Energy Electron Diffraction (LEED), IFIMAC researchers also investigate topics like 2D structural phase transitions, surface charge density waves, or the electronic structure of laterally nanostructured systems. Furthermore, we study the growth and properties of nanometer-scale objects on solid surfaces with applications in spintronics, optoelectronics, magnetic recording, nanoscale catalysis, nanomechanical biosensing, medical nanoimaging, etc.

IFIMAC researchers work actively in 2D materials and heterostructures, and its associated topological properties. Recently, they have predicted, on the basis of DFT, a quantum phase transition in franckeite (Figure 9), originating from stoichiometric changes in one of its composing layers (the quasihexagonal one). Franckeite is a na tural superlattice composed of two alternating layers of different composition, easy to exfoliate into very thin heterostructures, which has shown potential for optoelectronic applications. Not surprisingly, its chemical composition and lattice structure are so complex that franckeite has escaped screening protocols and high-throughput searches of materials with nontrivial topological properties. Now, it has been predicted that, while for a large concentration of Sb, franckeite is a sequence of type-II semiconductor heterojunctions, for a large concentration of Sn, these turn into type-III, much alike InAs/GaSb artificial heterojunctions, and franckeite becomes a strong topological insulator. Transmission electron microscopy observations confirm that such a phase transition may actually occur in nature.

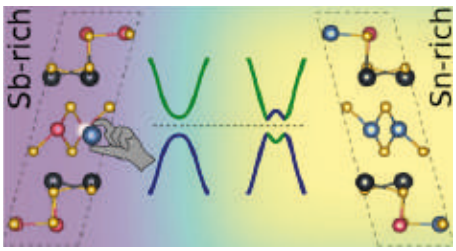


Figure 9: A quantum phase transition, predicted from DFT calculations and originating from stoichiometric changes in one of its composing layers (a large concentration of Sn in the quasihexagonal one) turns franckeite into a strong topological insulator. From ***Nano Lett.*** *21, 7781 (2021).*

Other important areas of expertise in our center are the fields of Nanoelectronics and Quantum Transport. In particular, in recent years researchers at IFIMAC have played a leading role in the understanding of the electronic transport in a great variety of nanoscale systems such as metallic atomic-size contacts, single-molecule junctions, superconducting hybrid structures, or strongly correlated low-dimensional systems. The study of thermoelectricity in molecular junctions is of fundamental interest for the development of various technologies including cooling (refrigeration) and heat-to- electricity conversion. IFIMAC researchers have developed theoretical methods, based on self-energy-corrected density functional theory calculations, to characterize the electrical and thermoelectric properties of molecular junctions (Figure 10).

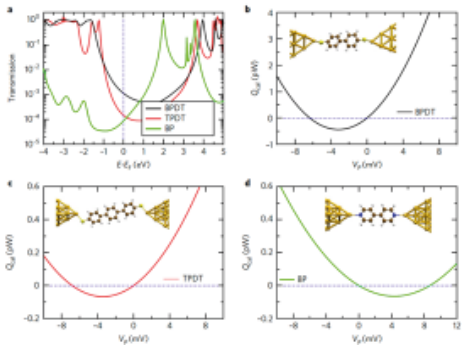


Figure 10: (b-d) Computed heating/cooling effect in the molecular junctions formed by gold electrodes and prototypical molecules (Au–biphenyl-4,4' -dithiol–Au, Au–terphenyl-4,4' ' -dithiol–Au and Au–4,4' -bipyridine–Au). The transmission (a) and its derivative at EF determine the electrical conductance and the Seebeck coefficient of the molecular junctions. From ***Nat. Nanotechnol****. 13, 122 (2018).*

Within the area of nanoelectronics, our groups are currently developing a strong theoretical/experimental activity on hybrid superconducting devices. This work ranges from the understanding of their basic transport properties to their potential application for quantum information processing using microwave techniques of the so-called Andreev qubits. The qubit is based on a circuit that consists of a submicron indium arsenide (InAs) nanowire enclosed by a superconducting aluminum loop (Figure 11). Discrete localized states, known as “Andreev bound states,” form in the nanowire as a result of coupling to the superconductor. When the absorption of a photon induces a transition between two of these states, the loop inductance changes. The absorption spectrum of the circuit can be measured by monitoring the resulting frequency shift of a microwave resonator inductively coupled to the loop. The spectrum shows a fine structure of spin-split Andreev states, well accounted for by a simple model with spin-orbit coupling as the key ingredient.

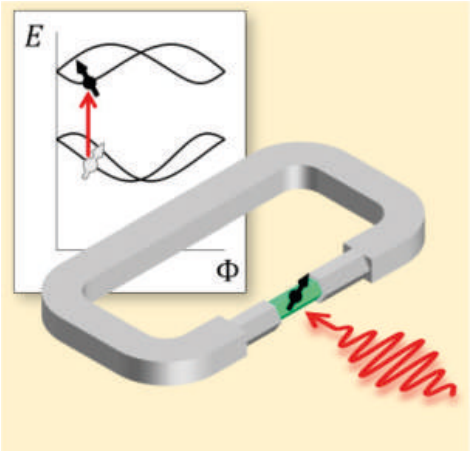
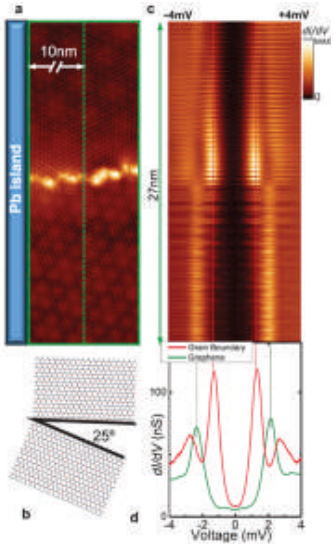


Figure 11: Spin-Orbit Splitting of Andreev States Revealed by Microwave Spectroscopy. The circuit includes an InAs nanowire enclosed by a superconducting aluminum loop. The spin state of a single electron in the nanowire has a measurable impact on the electrical properties of the circuit. From ***Phys. Rev. X*** *9, 011010 (2019).*



A very important topic in our center is also the use and modeling of Scanning Probe Microscopes (SPMs). Atomic Force Microscopy (AFM) is being currently used for the study of the mechanical, electrical and frictional properties of low-dimensional materials. Another key subject is the use of cryogenic Scanning Tunneling Microscopy (STM) and Spectroscopy (STS) for the surface characterization of semiconductor and superconductor nanostructures. One recent example involves the first observation of Yu–Shiba–Rusinov (YSR) states in graphene (Figure 12). Superconductivity in graphene is induced by proximity effect brought by adsorbing nanometer-scale superconducting Pb islands. Using STM and STS the superconducting proximity gap is measured and YSR states are visualized, extending more than 20 nm away from the graphene grain boundaries. These observations provide the long-sought experimental confirmation that graphene grain boundaries host local magnetic moments and constitute the first observation of YSR states in a chemically pure system. From a theoretical point of view, IFIMAC researchers are among the worldwide leaders in the area of ab initio modeling of nanowires and SPMs.

*Figure 12: Grain Boundary (GB) magnetism induces Yu–Shiba–Rusinov states in superconducting graphene. From **Advanced Materials** 33, 2008113 (2021).*

Nano and Quantum Optics

The related areas of Nano and Quantum Optics are dedicated to the stu dy of light-matter interactions at the nanoscale and at a quantum level and are two promising lines for the development of efficient, energy-saving, and compact platforms for future information technology. Nanophotonic systems offer a key advantage over other platforms: Their unique ability to concentrate light in the nanoscale (Figure 13) enables scalability and integration in the solid-state, and at the same time gives access to the quantum properties of photons. IFIMAC hosts a group of internationally recognised researchers working in this field and counts with extensive laser lab facilities for spatial, spectral, and angular characterization of nano and quantum optical effects.

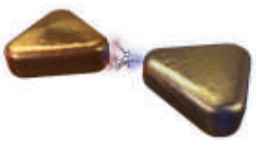


*Figure 13: Light focused on the nanoscale can interact with quantum emitters, including complex molecules From , **Angew. Chem. Int. Ed**. 58, 8698 (2019)*

*Figure 14: Nanophotonic structures allow confining light on the nanoscale. From **ACS Photonics**, 5(9), 3447-3451 (2018).*

Nano Optics is devoted to the study of electromagnetic field propagation, confinement, and interaction with matter at a sub-wavelength scale. Advances in fabrication and characterization techniques nowadays permit the study of optical phenomena at the nanoscale. Researchers at IFIMAC have made seminal contributions to the field through the study of nano-plasmonic systems, including the phenomenon of extraordinary optical transmission through subwavelength apertures or the proposal of spoof surface plasmon polaritons that mimic the light confinement properties of metals but at lower frequencies. Other important contributions were in the field of plasmon-assisted transport in atomic-scale junctions and the propagation of electromagnetic waves in magneto-plasmonic nanostructures (Figure 14). Light-matter interaction in two-dimensional systems, such as graphene and graphene-based heterostructures, graphene relatives, transition metal dichalcogenides and their combination in vertical stacks are also investigated at IFIMAC.

Quantum optics is a related field of research, merging the areas of quantum field theory and optics, and dealing with phenomena involving light and its interaction with matter at the quantum level. The field has evolved considerably from its early studies of coherence properties of radiation and parametric processes of light to recent topics of investigation such as quantum information, manipulation of single atoms, Bose-Einstein condensation, etc. Theorists at IFIMAC have produced seminal contributions to the understanding of light emission and absorption spectra in low-dimensional semiconductor structures. We have worked on the quantum optics produced by interacting bosonic complexes describing cavity polaritons and contributed with pioneering works on the superfluidity and coherence properties of polariton gases both under resonant and non-resonant pumping (Figure 15).

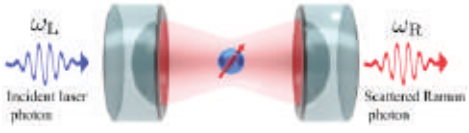


*Figure 15: Ultrastrong coupling enables the spontaneous Raman scattering of incident radiation. From **Phys. Rev. Lett**. 129, 273602 (2022).*

IFIMAC gathers leading theorists worldwide on **quantum nanophotonics**, the area of overlap between nano and quantum optics. The group has extensive experience on designing nanophotonic systems to achieve and control interactions between quantum emitters and photon modes and to generate quantum states of light, with a particular focus on hybrid plasmonic-photonic structures that combine the advantages of strong field confinement and long lifetimes. The group has also been at the forefront of a new interdisciplinary area of research aimed at taking advantage of QED phenomena such as strong light-matter coupling to manipulate atomic, molecular, and condensed-matter systems, and has participated actively in the birth and development of this new area of research through several seminal contributions (Figures 16 and 17).

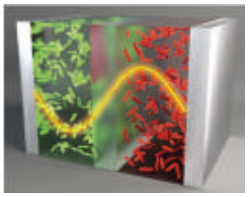


*Figure 16: Energy transfer between molecules is modified by the presence of vacuum fields in a photonic cavity. From **Science** 373, eabd0336 (2021).*

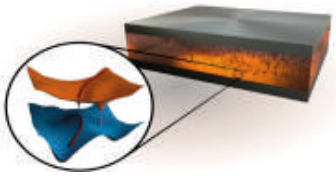
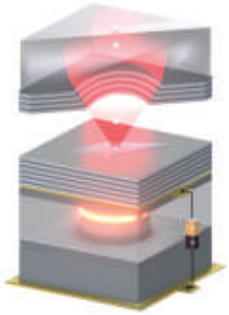


*Figure 17: With polaritonic chemistry, chemical structure can be manipulated through strong coupling between light and matter. From **ACS Photonics** 9, 1096 (2022).*

Figure 18: Sketch of a room temperature single photon source for quantum communication protocols. A quantum emitter (such as a defect in hBN) couples to the open cavity, enhancing the single photon emission.



Experimental groups at IFIMAC have a long experience on optical spectroscopy of semiconductor low-dimensional systems, such as quantum optics based on semiconductor quantum dots. IFIMAC researchers have expertise in photon correlation techniques, properties of single photon emitters (Figure 18), time-resolved spectroscopy, quantum microcavities based on semiconductor nanostructures, exciton polaritons, and on the preparation of Bose-Einstein condensates in solid-state systems. Furthermore, we have also developed compact laser sources based on plasmonic nanoparticles. Another very active area of experimental research at IFIMAC is the study of exciton diffusion in complex semiconductors or perovskites to optimise their ability to harvest solar energy, in combination with artificial intelligence approaches (Figure 19).

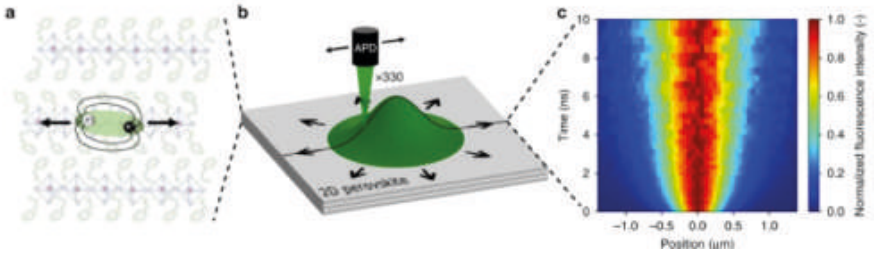


*Figure 19: Excitons in a two-dimensional perovskite are schematically represented in a. Excitons are imaged as shown in b and produce a time and position dependent fluorescence. From **ACS Energy Lett**. 7, 358 (2022).*

Soft Matter and Biophysics

Soft condensed matter comprises a variety of mesoscopic physical systems that are easily deformed by small thermal or mechanical stresses, including liquids, colloids, polymers, liquid crystals, gels, membranes, foams, etc. The relevant length and time scales of these systems are thus naturally larger than those of atoms or molecules, which facilitates experimentally accessing the microscopic states of these systems to understand and predict their emergent macroscopic properties, using the framework of statistical mechanics. Using vibrated granular particles, a variety of fluid patterns with orientational order that resemble equilibrium liquid-crystal phases were found, exhibiting topological defects due to confinement, much as molecular liquid crystals (Figure 20). This system represents a novel approach to study order in 2D fluids of hard particles.

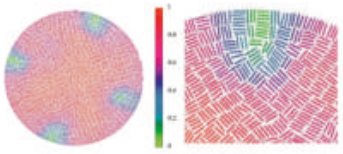


*Figure 20: Exotic liquid crystalline phases in monolayers of vertically vibrated granular particles. From **Liquid Crystals**, 2023. https://doi.org/10.1080/02678292.2023.2200262*

Figure 21: Aqueous two-phase systems within selectively permeable membranes. From ***ACS Macro Lett.****, 12, 132 (2023).*

Biological systems are also soft and built on the rich diversity of mesoscale structures mentioned. A tissue is a soft hydrogel, a hierarchical dynamic structure composed by many cells, which in turn are made up of many molecular assemblies orchestrating processes at different length and time scales. These systems set the most outstanding challenge in our goal to understand the spontaneous self-assembly of matter. Bottom-up approaches to recreate biological systems may enable to isolate fundamental physical principles from the complex set of signaling and metabolic pathways of natural systems. With this in mind, we have recently transferred microfluidic technologies from Harvard to IFIMAC, to fabricate vesicles as cell mimetics with exquisite control, enabling to study physical phenomena such as adhesion, fusion, and motility in model systems. These vesicles can also mimic the complex organization of the cell cytoplasm. IFIMAC researchers have used this technology to fabricate vesicles enclosing aqueous compartments to study the effect of permeable membranes in phase separations (Figure 21). Importantly, these vesicles may also find applications in biomedicine, pharmacy, and cosmetics.

Moreover, biological systems are active, they constantly produce and consume energy, which results in the emergence of sometimes unintuitive collective properties. The emergent subdiscipline of Active Matter focuses on understanding such collective properties, which frequently requires out-of-equilibrium physics descriptions. Using bacteria, modeled as run-and-tumble particles, IFIMAC researchers are studying the emergence of collective motion in confined environments (Figure 22).

Figure 22: Trapping flocking particles with asymmetric obstacles. From ***Soft Matter****, 16, 4739, 2020.*

Molecular Dynamics (MD) simulations are a powerful tool to understand biological processes at the atomic scale. IFIMAC researchers are applying them to the study of proteins, nucleic acids and viruses in their native liquid environment. The elasticity of double-stranded DNA (dsDNA) is a key molecular determinant in the many cellular contexts in which this molecule is found, as it affects the binding affinity of dsDNA with proteins as well as the dsDNA response to the mechanical action exerted by proteins. Using all-atom MD simulations, IFIMAC researchers have proposed that parts of the DNA sequence act as a physical code that controls the structure and mechanical properties of dsDNA at short scales, paving the way for protein-DNA interaction and organization of the genomic material (Figure 23). This work has been extended to dsRNA, where they identified a sequence motif consisting of alternating adenines and uracils, or AU-tracts, that strongly bend the RNA double-helix. This result may be exploited in the emerging field of RNA nanotechnology and might also constitute a natural mechanism for proteins to achieve recognition of specific dsRNA sequences.

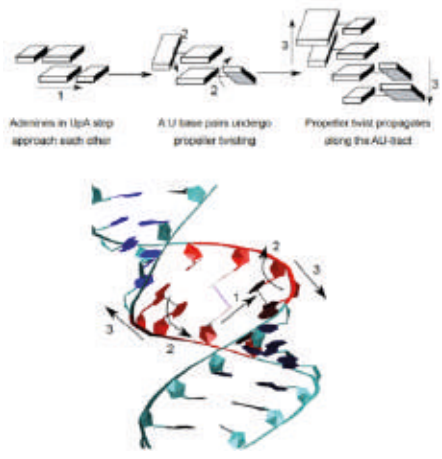


Figure 23: Proposed mechanism for AU-tract induced bending. AU-tract bending is illustrated using rigid blocks representation (top) and a snapshot of the molecular dynamics trajectory (bottom, AU-tract is marked in red). From ***Nucleic Acid Res****. 22, 12917 (2020).*

IFIMAC has a strong tradition in the construction and use of scanning probe microscopes, in particular in Atomic Force Microscopy (AFM). One of the most exciting applications of AFM is the characterization of biological material at the single-particle level. Physical Virology, the study of viruses usually involve bulk experiments, which gather average data from large ensembles of structures, thus considering all the particles as indistinguishable. However, biochemical processes are highly asynchronous and intermediate states are poorly populated. Therefore, average measurements might conceal details of the processes taking place in viruses. AFM allows the imaging and manipulation of individual virus particles adsorbed on a surface in liquid milieu by using a sharp tip (~10 nm) located at the end of a microcantilever.

In this way, IFIMAC researchers study the electrostatic charge of virus structures, monitor differences between wild type and mutant viruses during disassembly, and resemble the disruption process of viruses taking place during infection (Figure 24). Some of these studies are supported by MD simulations using coarse-grained models and simulation codes developed at IFIMAC.

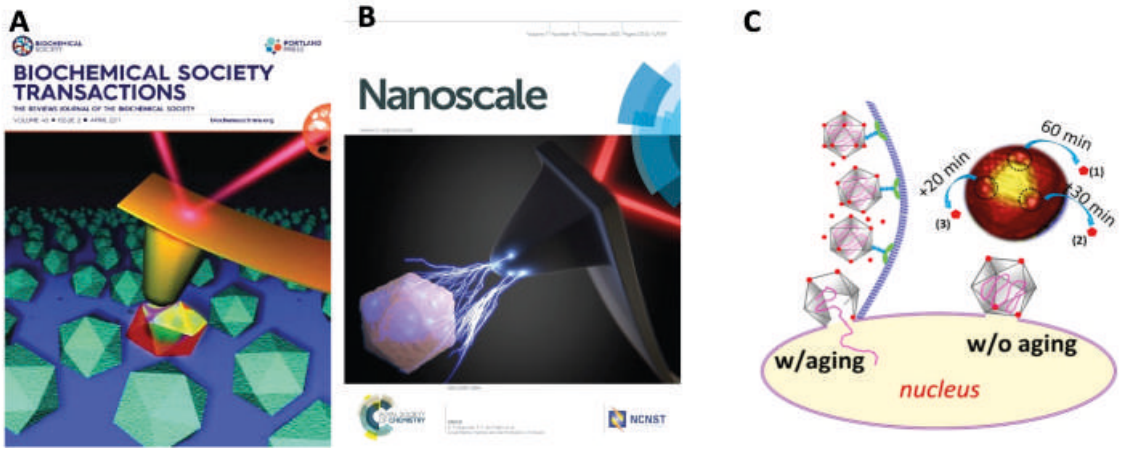


Figure 24: AFM is the perfect tool for seeing and touching individual viruses (A), allowing the study of the electrostatic charge of virus structures (B), and resemble the disruption process of viruses taking place during infection (C). From: ***Biochem. Soc. Trans****. 45, 499 (2017);* ***Nanoscale*** *7, 1728 (2015), and* ***Phys. Rev. X*** *11, 021025 (2021).*

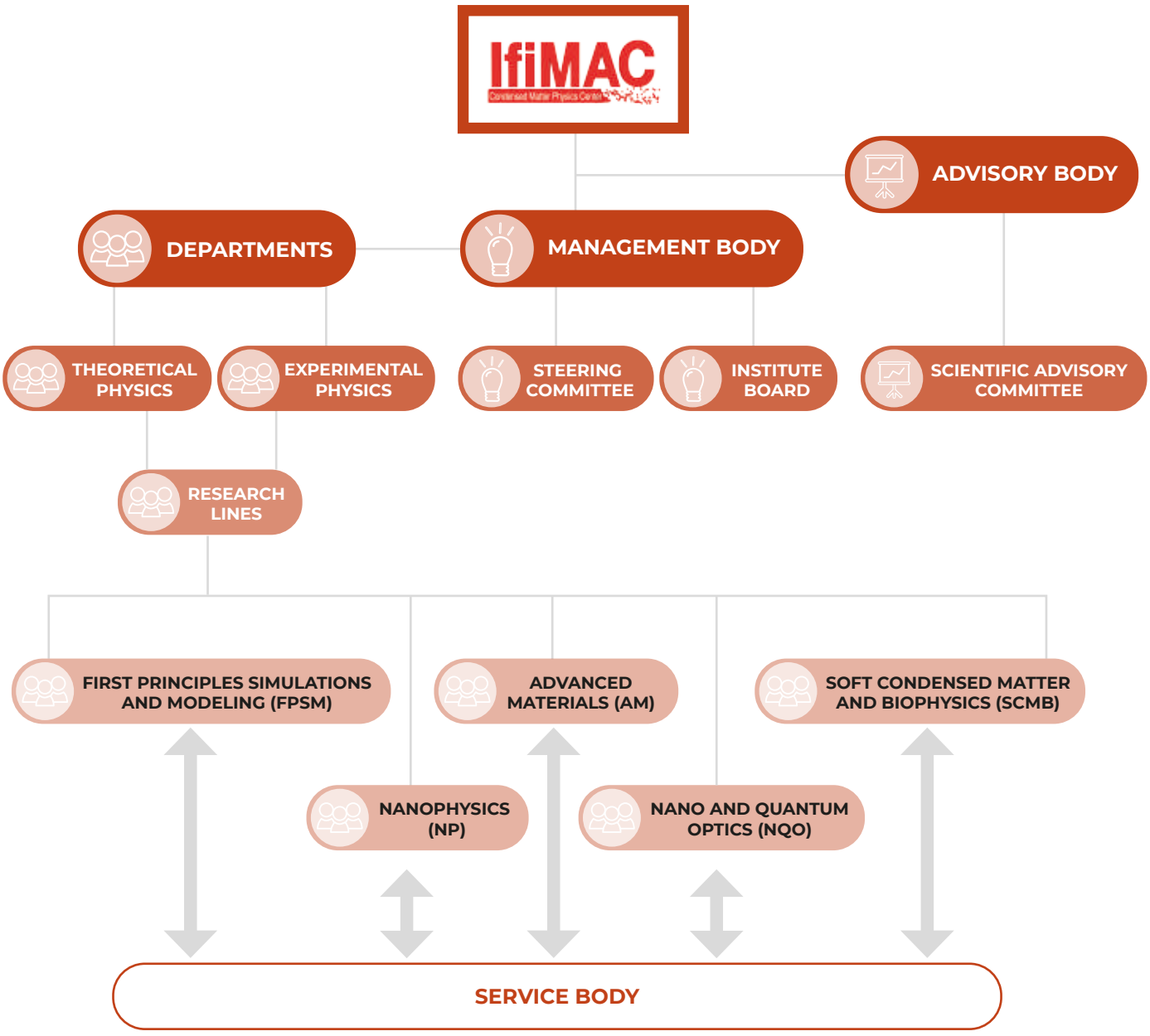
IfiMAC
Condensed Matter Physics Center

2 ORGANIZATION

- Organization Chart
- Steering Committee
- Communication Committee
- Gender Equality Committee
- Seminars Committee
- Scientific Advisory Board

IfiMAC
Condensed Matter Physics Center

Organization Chart



Steering Committee

Rubén Pérez Pérez

IFIMAC Director

Full Permanent Professor at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Luisa E. Bausá López

IFIMAC Deputy Director

Full Permanent Professor at the Department of Physics of Materials, Universidad Autónoma de Madrid.

Antonio I. Fernández-Domínguez

Member

Professor at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Cristina Gómez-Navarro González

Member

Professor at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

Félix Zamora Abanades

Member

Full Permanent Professor at the Department of Inorganic Chemistry, Universidad Autónoma de Madrid.

Hermann Suderow

Infrastructure development

Full Permanent Professor at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

Communication Committee

As members of the Communication Committee, their mission is to enhance the visibility of the activities, achievements, and news from the Center. Their research communication aims to promote a greater understanding of science, its relevance to everyday life, and its role in addressing global challenges.

Pablo Ares García
Head of the Committee
Ramón y Cajal Fellow at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid

Carlos Antón Solanas
Member
CM-Talento Fellow at the Department of Physics of Materials, Universidad Autónoma de Madrid.

Paloma Arroyo Huidobro
Member
Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Antonio I. Fernández-Domínguez
Member
Professor at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Diego Martín Cano
Member
Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Ferry Prins
Member
Ramón y Cajal Fellow at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

Gender Equality Committee

In April 2021, the Gender Equality Committee was created at IFIMAC. Its main goal is to promote good practices and organize activities that support women's role in science, especially within IFIMAC, while also raising awareness about gender equality among its members.

Cristina Gómez-Navarro
Mentoring Program Coordinator
Professor at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

Isabel Guillamón
Member
Associate Professor at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

Francesca Maria Marchetti
Member
Associate Professor at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Elena del Valle Reboul
Member
Associate Professor at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Johannes Feist
Member
Associate Professor at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Carlos Antón Solanas
Member
CM-Talento Fellow at the Department of Physics of Materials, Universidad Autónoma de Madrid.

Diego Martín Cano
Member
Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Celia Polop
Member
Professor at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid

The committee's activities focus on different areas: **monitoring and evaluation, participation, visibility and awareness, and student support**.

1. **Monitoring gender balance at IFIMAC**, based on our initial gender equality report. We analyze key indicators and statistics, collecting gender-disaggregated data. Evaluating aspects like the number of principal investigators in competitive projects, and grant or fellowship recipients. The graph below depicts the evolution of the percentage of women at IFIMAC during the last years. Notably, our monitoring shows a growing percentage of women at IFIMAC, and we are committed to maintaining this positive trend. (See IFIMAC at glance for details)
2. **Mentoring Program**: Establishing the third edition of our mentoring program for women physics students has been a key focus this year. One of the committee's first initiatives was launching a mentoring program for undergraduate women physics students, aimed at creating a close and supportive connection with research activities. The program offers:

   - Support for women students pursuing graduate and master's degrees in physics.
   - Woman role models to inspire and guide students.
   - Training and empowerment for mentors.
   - A strong academic network for women in physics.

   This year, 41 mentees are enrolled, meaning 40% of women physics students at UAM are now part of the program. Additionally, over 45% of senior researchers at IFIMAC are engaged as mentors.

   A key component of this initiative is the required training in mentoring and gender in science for both mentors and mentees led by an external expert from Skills4Science. There is also an evaluation and training session held mid-year.

3. **Promoting Outreach Activities on Women in Science**: To celebrate the International Day of Women and Girls in Science on February 11th, we organized a science fair featuring a series of interactive workshops. (See outreach section for details)
4. We also **participated in several educational centers** by giving talks and organizing workshops. Some of these initiatives include:

   - Cristina Gómez-Navarro: ***"Mamá, quiero ser científica, ¿y ahora qué?"*** at IES Alfredo Krauss.
   - Arin Escobar Ortíz (PhD): ***"Simulations: Physics in Your Laptop"*** at IES Iturralde.
   - Elena del Valle & Arianna Barreto (mentee): ***"Ondas, Sonido y Música"*** at CEIP Virgen del Rosario.
   - Elena del Valle & Sofía Quiñonez (mentee): ***"La buena onda: un taller musical y luminoso"*** at Semana de la Ciencia UAM.
   - Linda Zotti & Sofía Usandizaga (mentee): ***"¿De qué está hecha la materia que nos rodea?"*** CEIP Príncipe de Asturias.

The committee remains devoted to expanding these initiatives and continuing to foster an inclusive and supportive environment for women in science.

Seminars Committee

As members of the IFIMAC seminar committee, their main objective is to organize the center's seminars and colloquia. This includes planning the schedule, selecting speakers, coordinating logistics, and promoting the events.

Iván Brihuega
Member
Professor at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

Antonio I. Fernández-Domínguez
Member
Professor at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Isabel Guillamón
Member
Associate Professor at the Department of Condensed Matter Physics, Universidad Autónoma de Madrid.

Laura Rodríguez Arriaga
Member
Ramón y Cajal Fellow at the Department of Theoretical Condensed Matter Physics, Universidad Autónoma de Madrid.

Scientific Advisory Board

Prof. Juan Ignacio Cirac
Scientific Director at the Max-Planck Institut für Quantenoptik (Germany).

PhD. Enrique Espi Guzman
Technical Advisor, Repsol DeepTech (Spain).

Prof. Nicola Marzari
Director at MARVEL, National Centre of Competence in Research on Computational Design and Discovery of Novel Materials, École Polytechnique Fédérale de Lausanne (Switzerland).

Prof. Monica Olvera de la Cruz
Lawyer Taylor Professor at the Department of Materials Science, Northwestern University (USA).

Prof. Päivi Törmä
Professor at the Department of Applied Physics, Head of the Quantum Dynamics (QD) research group. Aalto University (Finland).

Prof. Roser Valentí
Professor at the Institut für Theoretische Physik, Goethe Universitat Frankfurt am Main, Frankfurt (Germany).

IfiMAC
Condensed Matter Physics Center

3 IFIMAC AT A GLANCE

- Human resources
- Competitive projects
- Scientific production
- Training Activities
- Other research, transfer and outreach activities

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Condensed Matter Physics Center

Human resources

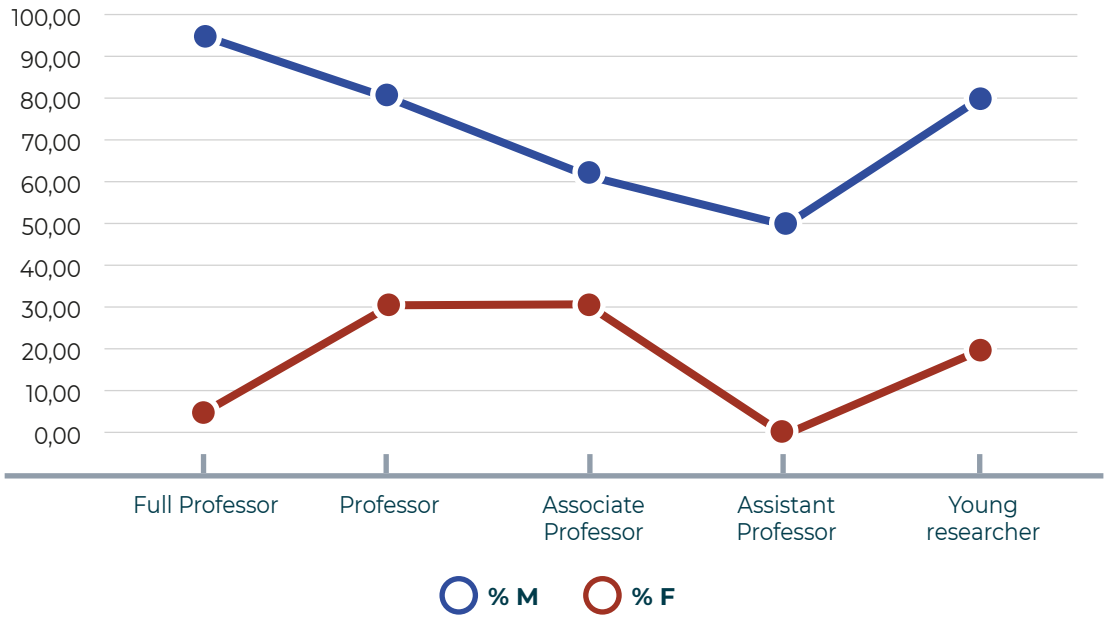
IFIMAC Researchers

NEW **1** new researcher affiliated during 2024

84

- **19** Full Professor
- **30** Professor
- **13** Associate Profesor
- **2** Assistant Professor
- **5** Emeritus Professor
- **15** Young researcher (RyC, Talent Grant, Junior Leader)

By gender:



IFIMAC Staff

6

- **2** IT and High-Performance Computing Infrastructure
- **2** Project Manager
- **1** Laboratoty Technician
- **1** Outreach

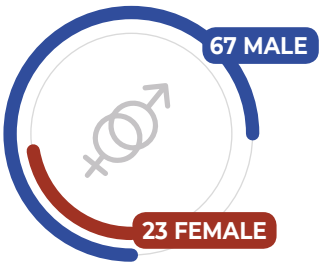
By gender:

Male: 50.00%

Female: 50.00%

IFIMAC Predoctoral

90



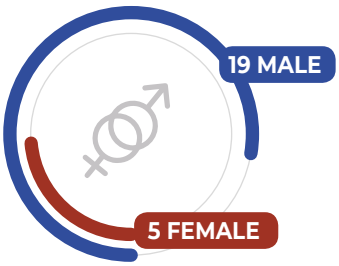
By gender:

Male: 74.44%

Female: 25.56%

IFIMAC Postdoctoral

24



By gender:

Male: 79.00%

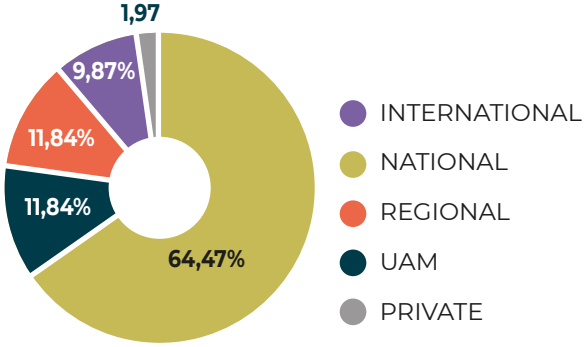
Female: 21.00%

Competitive projects

152

- **15** INTERNATIONAL
- **98** NATIONAL
- **18** REGIONAL
- **18** UAM
- **3** PRIVATE

Financial Agency: International, National, Regional (includes local projects).



3 ERC** projects (By gender: 2 female and 1 male). Total annual funding: **759,580.36€

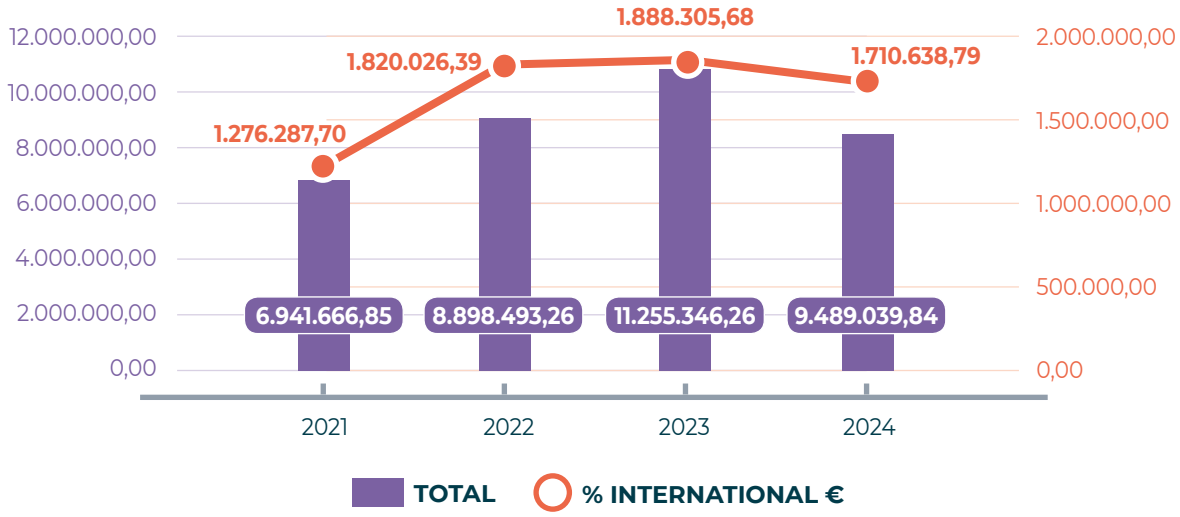
Funding

112,964.76€

by IFIMAC researcher

INTERNATIONAL	1,710,638.79€
NATIONAL	6,019,789.36€
REGIONAL	1,417,324.39€
UAM	245,778.13€
PRIVATE	95,509.17€
TOTAL ANNUAL FUNDING	**9,489,039.83€**

2021-2024: International funding VS Total Funding

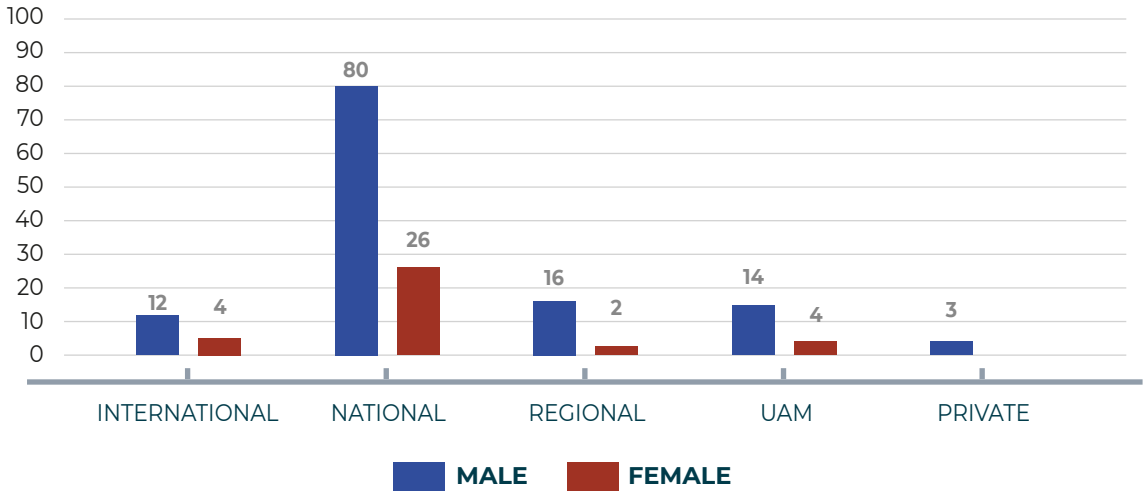


Competitive projects by gender and funding

78.00%
competitive projects lead by male

22.00%
competitive projects lead by female

31 competitive projects with two PI (male and female) and 4 lead by two female.



MALE	
INTERNATIONAL	1,066,813.24€
NATIONAL	4,993,599.66€
REGIONAL	1,385,430.37€
UAM	232,987.96€
PRIVATE	95,509.17€
TOTAL ANNUAL FUNDING	**7,774,340.41€**

FEMALE	
INTERNATIONAL	643,825.54€
NATIONAL	1,026,189.69€
REGIONAL	31,894.02€
UAM	12,790.17€
PRIVATE	0.00€
TOTAL ANNUAL FUNDING	**1,714,699.43€**

***100,864.67€** per IFIMAC woman researcher.*
***116,034.93€** per IFIMAC man researcher.*

Scientific production

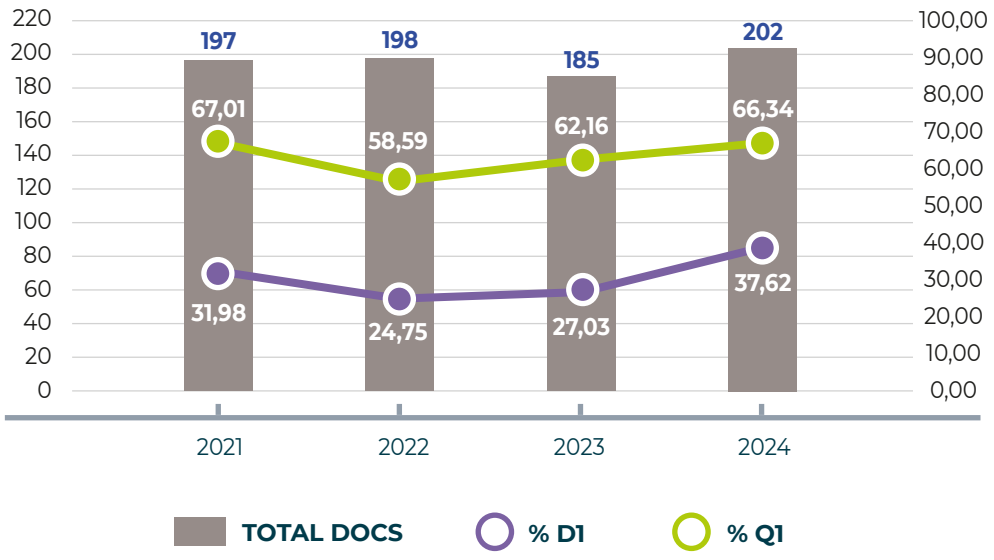
- **202 Docs** (WoS & Scopus)
- **100% citable items**
- **86.76% OA**

***2.40** papers by IFIMAC researcher.*

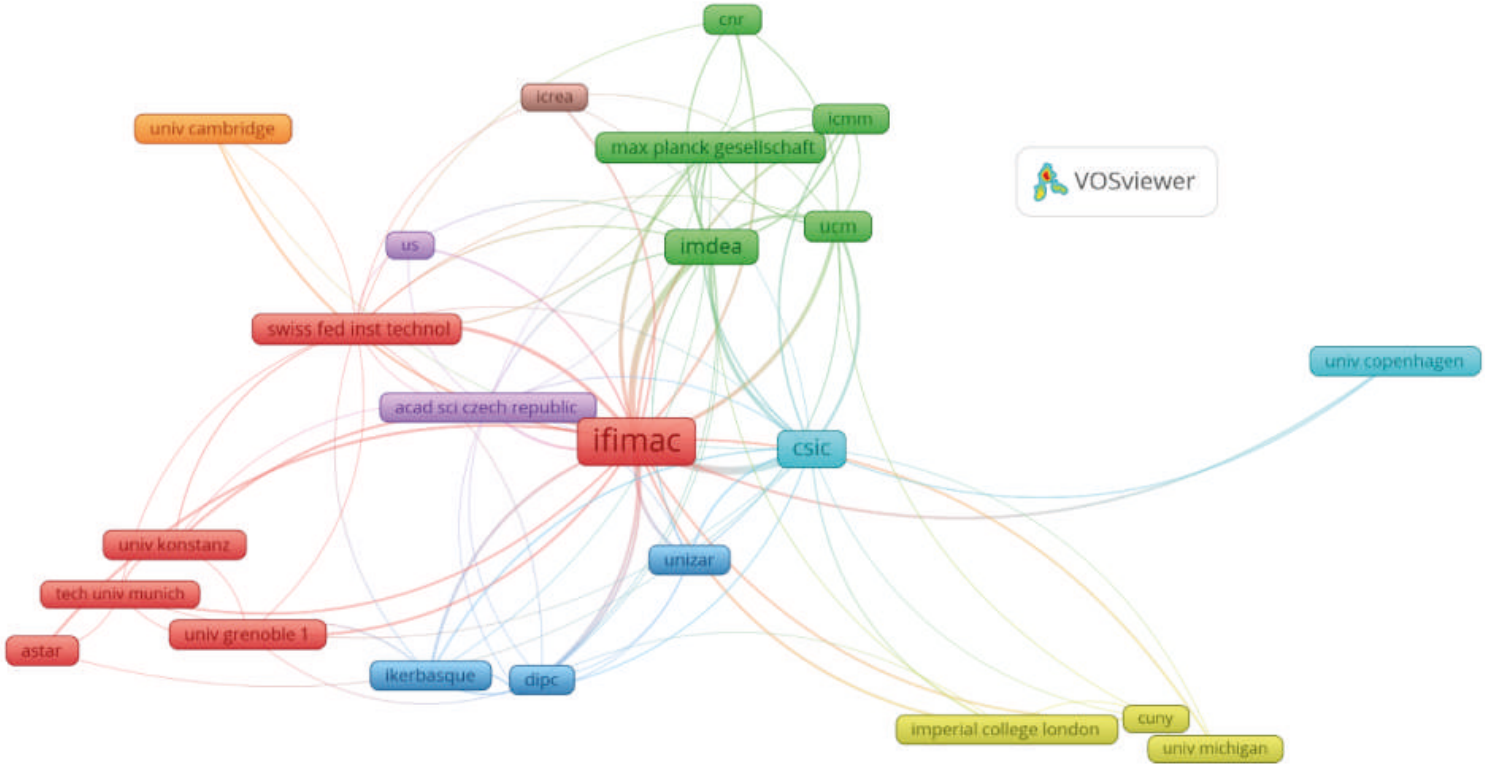
	Q1 (JCR)	D1 (JCR)
	134	76

	Q1 (SJR)	D1 (SJR)	NO SJR
Scopus	181	131	1

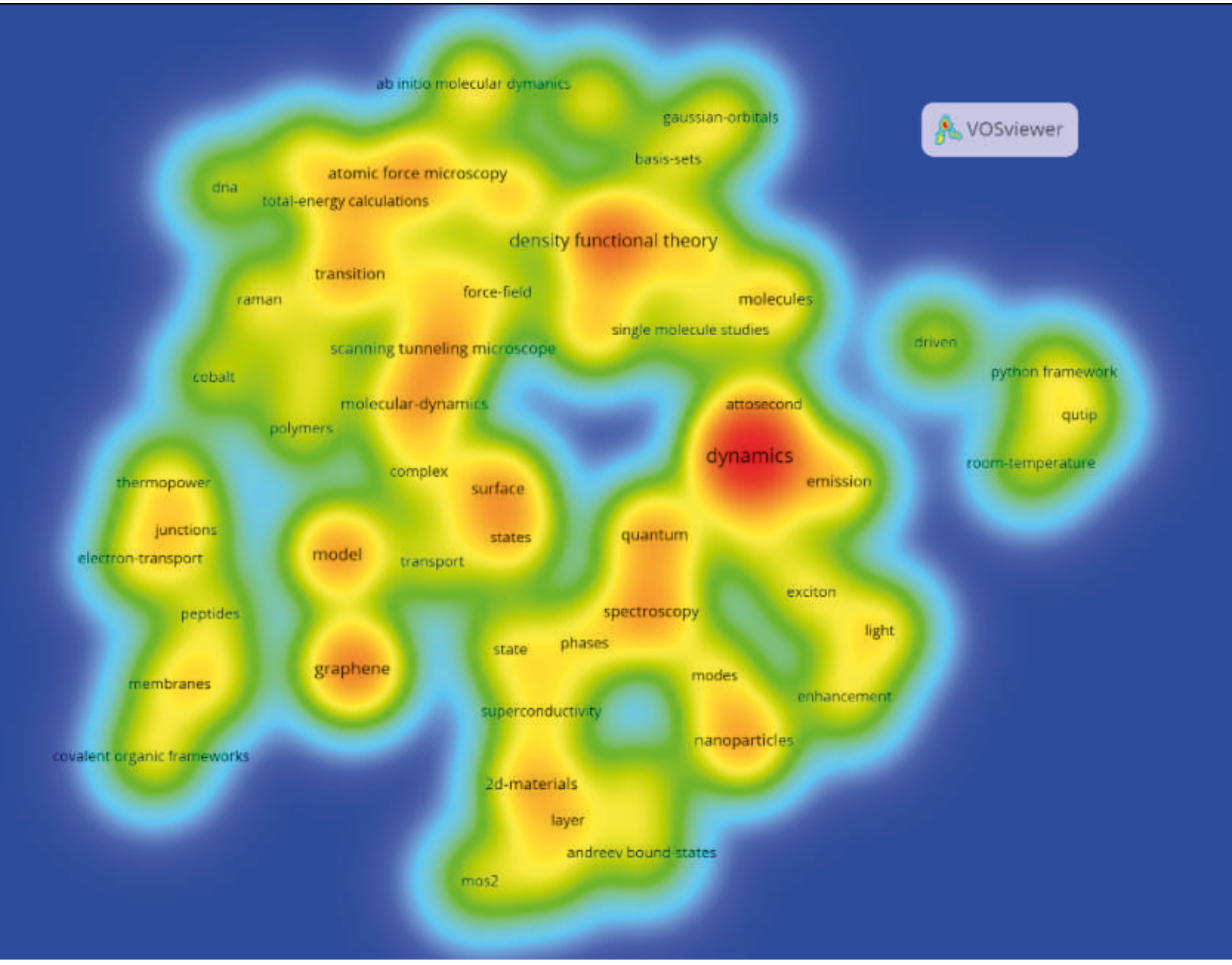
Evolution IFIMAC´s scientific production 2021-2024 (Source: WoS)



IFIMAc´s scientific collaboration. (Source: WoS)



IFIMAC´s scientific production by keywords. (Source: WoS)



Training Activities

- Doctoral thesis defended: **31**
  By gender: **70.96%** Male **29.03%** Female
- Predoctoral Fellowships Program of the Spanish AEI: **2** [1]
- IFIMAC's Master Fellowships: **10**
- Research Awards for Physics Students: **2**
- IFIMAC Mentoring Program: **41 mentees and 41 mentors**

[1] *All IFIMAC predoctoral students benefit from financial support for their doctoral thesis. In this item, we only highlight the FPI grants linked to the María de Maeztu Unit of Excellence.*

Other research, transfer and outreach activities

- PATENT applications: **3**
- Awards: **3**
- Organization of congresses: **16**
- Invited lectures: **59**
- Sponsorships: **8**
- IFIMAC Colloquium: **7**
- IFIMAC Seminars: 2**6**
- Outreach activities: **23**

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Condensed Matter Physics Center

4 RESEARCH

- Research Highligths
- Young Researchers
- IFIMAC Colloquia Series and Seminars
- IFIMAC Day 2024
- Research Projects
- Publications
- Invited lectures
- Organization of congresses
- Sponsorships
- Patent applications
- Awards

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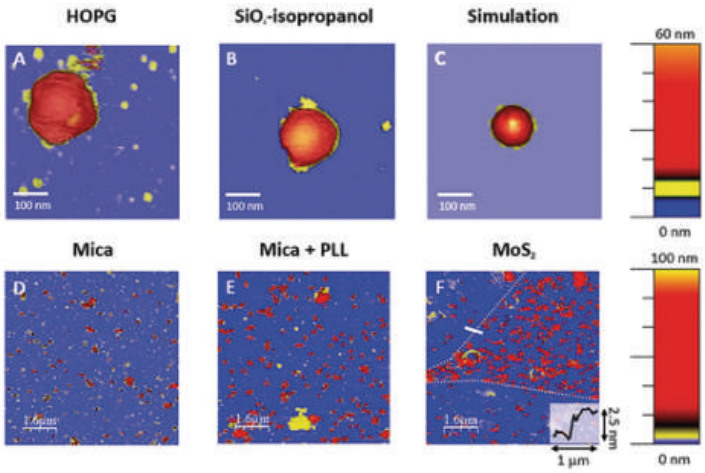
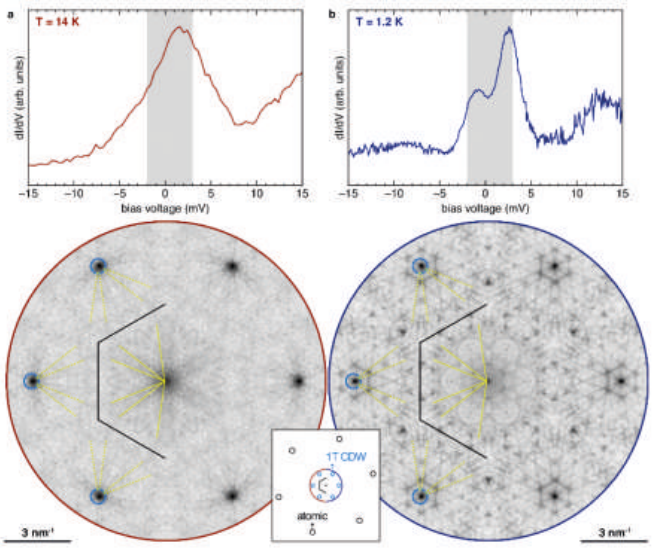
Research Highligths

Revealed from the Complementary Surface Affinity of Membrane and Spikes. Advanced Science, 11, 41, 2404186 (2024). DOI:

https://doi.org/10.1002/advs.202404186

A collaboration between **Rafael Delgado Buscalioni** and **Pedro J. de Pablo** reveals the virus adhesion adaptability of transmissible gastroenteritis coronavirus (TGEV). Atomic force microscopy shows deformation of 20-50% depending on surface interactions. Modeling highlights complementary adsorption affinities of the envelope and spikes, influencing adhesion energy.





Electron delocalization in a 2D Mott insulator. *Nat Commun* 15, 10272 (2024). DOI:

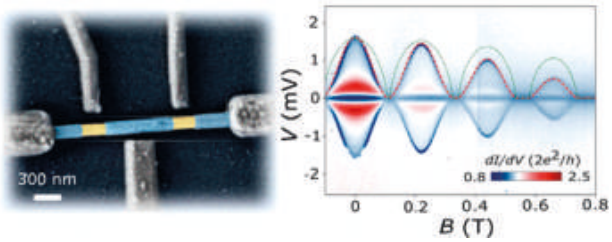
https://doi.org/10.1038/s41467-024-54747-4

A team led by **Amadeo Lopez Vazquez de Parga** has observed a quantum Kondo lattice in a 2D Mott insulator on a metallic substrate below 11 K. This discovery reveals how delocalized Mott electrons interact with substrate conduction electrons, forming a shared Fermi surface and introducing new system periodicity.

Heat Dissipation Mechanisms in Hybrid Superconductor–Semiconductor Devices Revealed by Joule Spectroscopy. Nano Lett. 24, 22, 6488-6495 (2024). DOI:

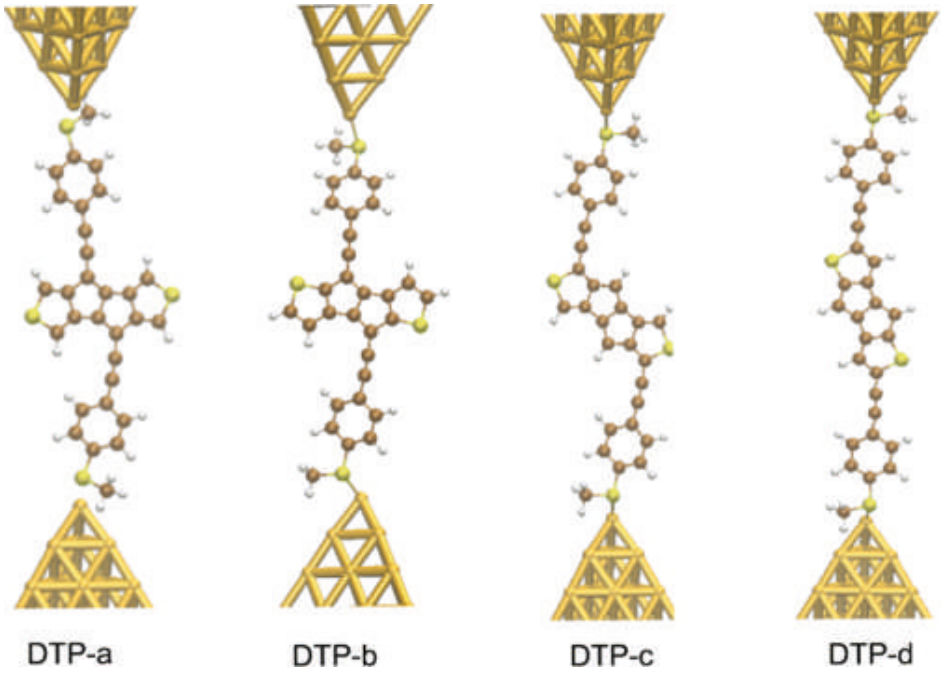
https://doi.org/10.1021/acs.nanolett.4c00574

Understanding heating and cooling in mesoscopic hybrid superconductor–semiconductor devices is crucial for quantum technologies, as self-heating affects performance. **Eduardo Lee** and coworkers show using Joule Spectroscopy that cooling in these devices is limited by inefficient electron-phonon coupling in superconducting islands, unlike grounded superconductors, which cool primarily through quasiparticle diffusion.



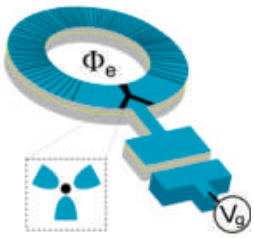
Antiaromatic non-alternant heterocyclic compounds as molecular wires. J. Mater. Chem. C 12, 4306-4315 (2024). DOI: *https://doi.org/10.1039/D3TC04266A*

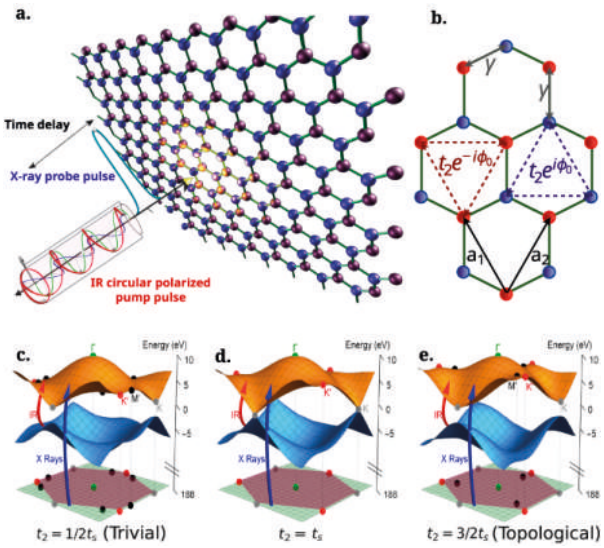
Antiaromatic compounds are of interest in molecular electronics for their low HOMO-LUMO gaps, promising high electrical conductance. A team led by **Linda Zotti** studied dithienopentalene molecular wires, finding that conductance is influenced by HOMO-LUMO gap reduction and destructive quantum interference, affected by heteroatom positions. Traditional "curly-arrow" rules failed for some isomers.



Quantum Circuits with Multiterminal Josephson-Andreev Junctions. PRX Quantum 5, 020340 (2024). DOI: *https://doi.org/10.1103/PRXQuantum.5.020340*

To mitigate environmental noise on qubits, a novel platform using multiterminal Josephson junctions has been proposed by **Alfredo Levy-Yeyati** and coworkers. Unlike conventional two-terminal junctions, multiterminal devices offer intrinsic noise immunity and additional tunability. Fabricated with current techniques, these junctions feature fermionic-bosonic coupling, akin to strong light-matter interactions, and resemble multidimensional lattices in circuit models.



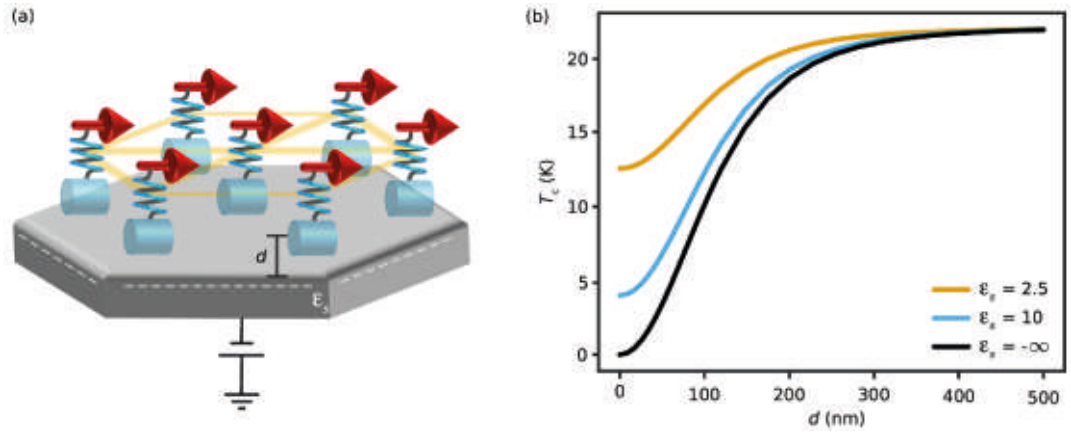


Topological phase transitions via attosecond x-ray absorption spectroscopy. *Rep. Prog. Phys.* 87 117901 (2024). DOI: *https://doi.org/10.1088/1361-6633/ad889f*

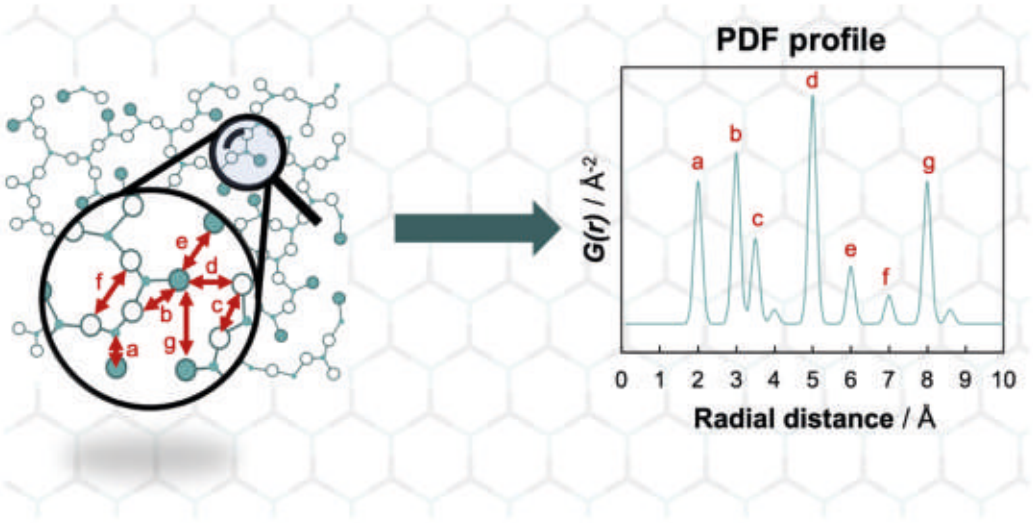
A numerical study led by **Antonio Picón** reveals that attosecond x-ray absorption spectroscopy can capture topological phase transitions in Chern insulators. Using ultrafast IR pump and x-ray probe pulses, laser-induced spectra reveal signatures tied to the system's Berry structure, advancing topological material studies.

Unconventional magnetism mediated by spin-phonon-photon coupling. Nat. Commun. 15, 4000 (2024). DOI: *https://doi.org/10.1038/s41467-024-48404-z*

An IFIMAC team theoretically demonstrated a biquadratic long-range interaction between spins mediated by phonon-polariton coupling, reminiscent of superconductivity. This interaction causes a first-order phase transition, leading to abrupt magnetization on cooling, enabling low-power magnetic memories with high data stability. Photon involvement allows in-situ control, presenting new scientific and technological opportunities.



Exploring porous structures without crystals: advancements with pair distribution function in metal- and covalent organic frameworks. *Chem. Soc. Rev.* 53, 11772 (2024). DOI: *https://doi.org/10.1039/D4CS00267A (Journal issue cover)*

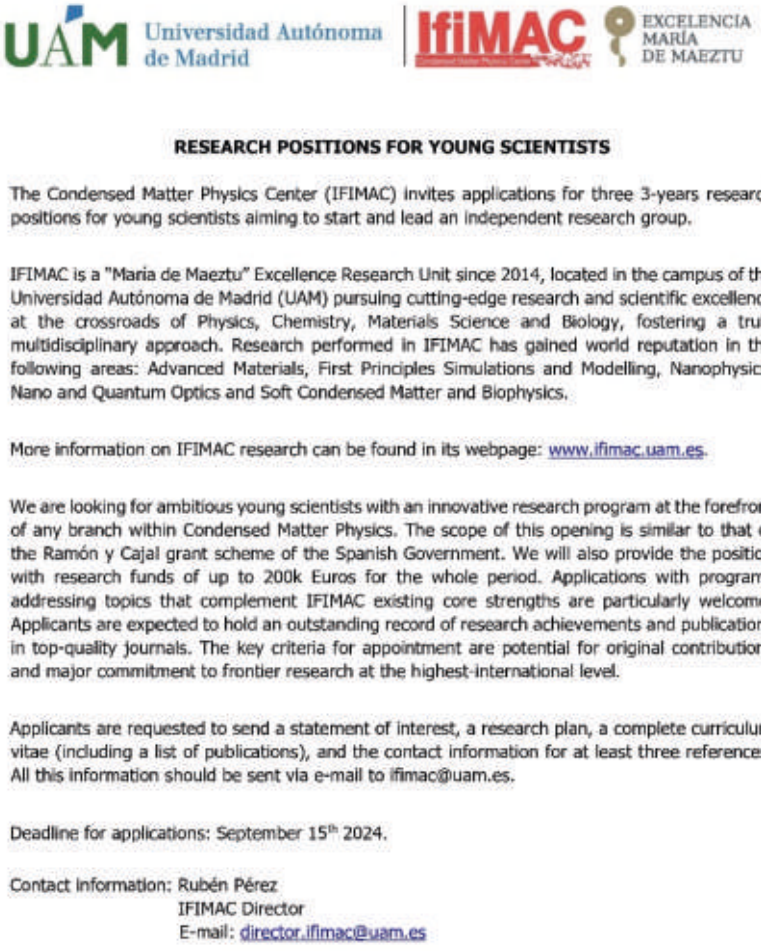


Ana Platero-Prats leads this review that explores the use of pair distribution functions (PDF) as a powerful approach to target current characterisation challenges in the field of metal- and covalent organic frameworks. By identifying molecular interactions on the pore surfaces, tracking complex structural transformations involving disorder states, and elucidating nucleation and growth mechanisms, structural analysis using PDF has provided invaluable insights into these materials.

Young Researchers

One of the objectives of the recently approved María de Maeztu Unit of Excellence is to recruit up to three outstanding young international researchers for a period of three years, along with additional funding to support the development of their research groups. In June 2024, the selection process began with the goal of hiring these researchers in the first quarter of 2025. The call was resolved in November 2024 with the selection of two researchers; one of them declined the offer, and the second, **Miguel Bello**, will join IFIMAC in 2025.

The vacancies were published on the IFIMAC website, Nature Careers, and EurAxess.



RESEARCH POSITIONS FOR YOUNG SCIENTISTS

The Condensed Matter Physics Center (IFIMAC) invites applications for three 3-years research positions for young scientists aiming to start and lead an independent research group.

IFIMAC is a "Maria de Maeztu" Excellence Research Unit since 2014, located in the campus of the Universidad Autónoma de Madrid (UAM) pursuing cutting-edge research and scientific excellence at the crossroads of Physics, Chemistry, Materials Science and Biology, fostering a truly multidisciplinary approach. Research performed in IFIMAC has gained world reputation in the following areas: Advanced Materials, First Principles Simulations and Modelling, Nanophysics, Nano and Quantum Optics and Soft Condensed Matter and Biophysics.

More information on IFIMAC research can be found in its webpage: www.ifimac.uam.es.

We are looking for ambitious young scientists with an innovative research program at the forefront of any branch within Condensed Matter Physics. The scope of this opening is similar to that of the Ramón y Cajal grant scheme of the Spanish Government. We will also provide the position with research funds of up to 200k Euros for the whole period. Applications with programs addressing topics that complement IFIMAC existing core strengths are particularly welcome. Applicants are expected to hold an outstanding record of research achievements and publications in top-quality journals. The key criteria for appointment are potential for original contributions and major commitment to frontier research at the highest international level.

Applicants are requested to send a statement of interest, a research plan, a complete curriculum vitae (including a list of publications), and the contact information for at least three references. All this information should be sent via e-mail to ifimac@uam.es.

Deadline for applications: September 15th 2024.

Contact information: Rubén Pérez
IFIMAC Director
E-mail: director.ifimac@uam.es

More information:
https://www.ifimac.uam.es/jobs-opportunities/ifimac-research-positions-for-experimental-young-scientists/

IFIMAC Colloquia Series and Seminars

In 2023, IFIMAC initiated the **IFIMAC Colloquia Series** a platform designed to convene distinguished experts from various fields within condensed matter physics. This initiative continued in 2024 and complemented our existing programs, including the ongoing **IFIMAC Seminars**. In 2024, 7 IFIMAC Colloquia Series and 26 IFIMAC Seminars were held.

IFIMAC Colloquia Series

Maia Vergniory: ***Topology is everywhere***
Donostia International Physics Center (Spain)
https://www.youtube.com/watch?v=XQtaE_KuSy4

Susana Huelga: ***Coherent Effects in Biological Processes***
Ulm University (Germany)
https://www.youtube.com/watch?v=enen2XdxcKQ

Florian Marquardt: ***Better Quantum Technologies via Machine Learning***
Max Planck Institute for the Science of Light (Germany)
https://www.youtube.com/watch?v=x0zPfMG7kts

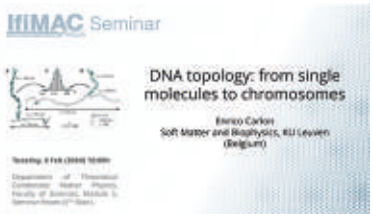
Vahid Sandoghdar: ***On single photons and single molecules***
Max Planck Institute for the Science of Light (Germany)
https://www.youtube.com/watch?v=nFWy7psEEPc

Ludovic Berthier: ***Is Glass a State of Matter?***
CNRS (France)
https://www.youtube.com/watch?v=tm_Txaq9em0

Mircea Dinca: ***From electrically conductive MOFs to sustainable batteries***
Massachusetts Institute of Technology (USA)
https://www.youtube.com/watch?v=BlcCCOYYCcs

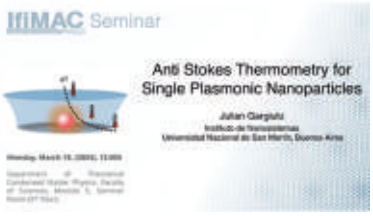
Javier García de Abajo: ***Quantum Nanophotonics with Free Electrons***
ICFO: The Institute of Photonic Sciences (Spain)
https://www.youtube.com/watch?v=r7aZxHgWwxM

IFIMAC Seminars



Enrico Carlon: ***DNA Topology: from single molecules to chromosomes***
KU Leuven (Belgium)
https://www.ifimac.uam.es/ifimac-seminars/dna-topology-from-single-molecules-to-chromosomes/

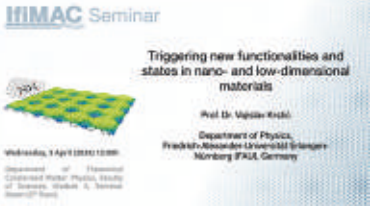
Johannes Gierschner: ***Scientific Integrity Decline in Current Materials Research: Insights and Vistas Beneath the Tip of the Iceberg***
IMDEA Nanociencia (Spain)
https://www.ifimac.uam.es/ifimac-seminars/scientific-integrity-decline-in-current-materials-research-insights-and-vistas-beneath-the-tip-of-the-iceberg/



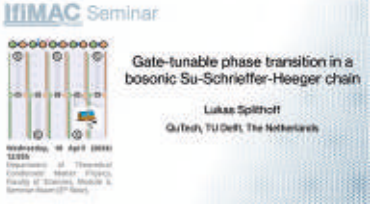
Julian Gargiulo: ***Anti Stokes Thermometry for Single Plasmonic Nanoparticles***
Universidad Nacional de San Martín (Argentina)
https://www.ifimac.uam.es/ifimac-seminars/anti-stokes-thermometry-for-single-plasmonic-nanoparticles/

Ipsita Mandal: ***Symmetry, exceptional points, and phase transitions***
Shiv Nadar Institute of Eminence and Freiburg Institute for Advanced Studies (Germany)
https://www.ifimac.uam.es/ifimac-seminars/symmetry-exceptional-points-and-phase-transitions/

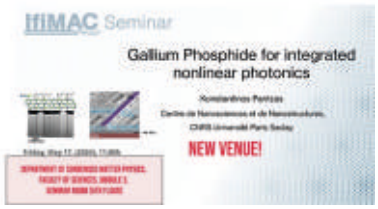
Iñigo Liberal: ***Time-varying media and their symmetries***
Universidad Pública de Navarra (Spain)
https://www.ifimac.uam.es/ifimac-seminars/time-varying-media-and-their-symmetries/



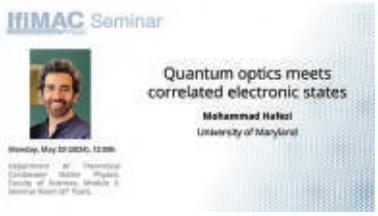
Vojislav Krstić: ***Triggering new functionalities and states in nano- and low-dimensional materials***
Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany)
https://www.ifimac.uam.es/ifimac-seminars/triggering-new-functionalities-and-states-in-nano-and-low-dimensional-materials/



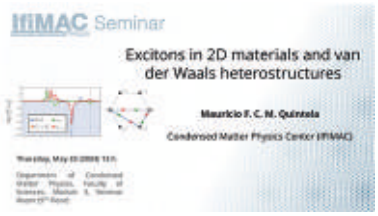
Lukas Splithoff: ***Gate-tunable phase transition in a bosonic Su-Schrieffer-Heeger chain***
TU Delft (The Netherlands)
https://www.ifimac.uam.es/ifimac-seminars/gate-tunable-phase-transition-in-a-bosonic-su-schrieffer-heeger-chain/



Konstantinos Pantzas: ***Gallium Phosphide for integrated nonlinear photonics***
CNRS Université Paris Saclay (France)
https://www.ifimac.uam.es/ifimac-seminars/gallium-phosphide-for-integrated-nonlinear-photonics/



Mohammad Hafezi: ***Quantum optics meets correlated electronic states***
University of Maryland (USA)
https://www.ifimac.uam.es/ifimac-seminars/quantum-optics-meets-correlated-electronic-states/



Maurício F. C. Martins Quintela: ***Excitons in 2D materials and van der Waals heterostructures***
University of Minho (Portugal)
https://www.ifimac.uam.es/ifimac-seminars/excitons-in-2d-materials-and-van-der-waals-heterostructures/

Mario Agio: ***Ultrafast coupling of light with quantum emitters***
University of Siegen (Germany); National Institute of Optics (INO-CNR) (Italy)
https://www.ifimac.uam.es/ifimac-seminars/ultrafast-coupling-of-light-with-quantum-emitters/

Gwan-Hyoung Lee: ***Control and Synthesis of Moiré and Fully Commensurate Structures in van der Waals Heterostructures***
Seoul National University. CEO / S-Graphene co. (South Korea)
https://www.ifimac.uam.es/ifimac-seminars/control-and-synthesis-of-moire-and-fully-commensurate-structures-in-van-der-waals-heterostructures/

Bayan Karimi: ***Ultrasensitive bolometry in quantum thermodynamics experiments***
Aalto University (Finland)
https://www.ifimac.uam.es/ifimac-seminars/ultrasensitive-bolometry-in-quantum-thermodynamics-experiments/

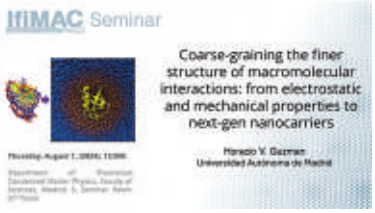
Malwina Anna Marczak: ***Fast optical-control of a coherent hole-spin in a microcavity***
University of Basel (Switzerland)
https://www.ifimac.uam.es/ifimac-seminars/fast-optical-control-of-a-coherent-hole-spin-in-a-microcavity/

Pranoti Kshirsagar: ***Under the Microscope – Spotlighting Materials & Nanoscience***
The Science Talk (Germany)
https://www.ifimac.uam.es/ifimac-seminars/under-the-microscope-spotlighting-materials-nanoscience/

Yue Ban: ***Mutual Reinforcement between Quantum Technologies and Machine Learning***
Universidad Carlos III de Madrid (Spain)
https://www.ifimac.uam.es/ifimac-seminars/mutual-reinforcement-between-quantum-technologies-and-machine-learning/

Spiros Skourtis: ***Trapped-ion simulations of molecular electron transfer, long-distance backbone charge transport in microsolvated DNA and centimeter-scale charge transport in bacterial cables***
University of Cyprus (Cyprus)
https://www.ifimac.uam.es/ifimac-seminars/trapped-ion-simulations-of-molecular-electron-transfer-long-distance-backbone-charge-transport-in-microsolvated-dna-and-centimeter-scale-charge-transport-in-bacterial-cables/

Vladimiro Mujica: ***Chiral discrimination in biological systems induced by spin-dependent van der Waals interactions***
Arizona State University (USA)
https://www.ifimac.uam.es/ifimac-seminars/chiral-discrimination-in-biological-systems-induced-by-spin-dependent-van-der-waals-interactions/



Horacio V. Guzman: ***Coarse-graining the finer structure of macromolecular interactions: from electrostatic and mechanical properties to next-gen nanocarriers***
Universidad Autónoma de Madrid (Spain)
https://www.ifimac.uam.es/ifimac-seminars/coarse-graining-the-finer-structure-of-macromolecular-interactions-from-electrostatic-and-mechanical-properties-to-next-gen-nanocarriers/

Juan David Jaramillo: ***The Statistical Mechanics of Nonequilibrium Spins***
Instituto de Física Interdisciplinar y de Sistemas Complejos (IFISC) (Spain)
https://www.ifimac.uam.es/ifimac-seminars/the-statistical-mechanics-of-nonequilibrium-spins/

Juan Schmidt: ***Interplay between bonding, magnetism and superconductivity in Sr(Ni1−xCox)2P2 and Sr(Ni1−xRhx)2P2 single crystals***
Ames Laboratory (USA)
https://www.ifimac.uam.es/ifimac-seminars/interplay-between-bonding-magnetism-and-superconductivity-in-srni1%e2%88%92xcox2p2-and-srni1%e2%88%92xrhx2p2-single-crystals/

Carlos Romero Muñiz: ***Raman and IR spectroscopy from first-principles***
Universidad de Sevilla (Spain)
https://www.ifimac.uam.es/ifimac-seminars/raman-and-ir-spectroscopy-from-first-principles/

Martín Maza-Cuello: ***Friction-driven vibratory transport***
Universidad de Navarra (Spain)
https://www.ifimac.uam.es/ifimac-seminars/friction-driven-vibratory-transport/

Mercè Roig I Server: ***Microscopic Models for Altermagnetism***
University of Copenhagen (Denmark)
https://www.ifimac.uam.es/ifimac-seminars/microscopic-models-for-altermagnetism/

Guillermo Acuña: ***DNA nanotechnology for nanophotonics***
University of Fribourg (Switzerland)
https://www.ifimac.uam.es/ifimac-seminars/dna-nanotechnology-for-nanophotonics/

Gabriela Pasquini: ***Exploring the interplay between nematicity and superconductivity through vortex system properties***
CONICET-Universidad de Buenos Aires (Argentina)
https://www.ifimac.uam.es/ifimac-seminars/exploring-the-interplay-between-nematicity-and-superconductivity-through-vortex-system-properties/

IFIMAC Day 2024

IFIMAC Day 2024 took place on 25 October, bringing together members of our community for a day of insightful presentations and discussions. The event opened with a welcome from José Luis Pau Vizcaíno, Vice Dean for Research, Innovation and Transfer of the Faculty of Science, and Daniel Jaque, Vice Rector for Scientific Policy of the UAM. The opening was followed by an overview of the main objectives of the new María de Maeztu Strategic Plan, presented by our Director, Rubén Pérez Pérez.

The morning session, chaired by Luisa Bausá, IFIMAC Deputy Director, featured two compelling talks that align closely with our strategic goals. Juan Carlos Cuevas shared groundbreaking research on heat transfer at the nanoscale, exploring its potential impact on nanotechnology advancements. Celia Polop then provided a comprehensive overview of the innovative energy materials being developed at IFIMAC, emphasizing their role in sustainable energy solutions and next-generation applications.

Following these scientific discussions, members of IFIMAC's technical team presented updates on key institutional aspects, including website development, facilities, and outreach initiatives. The session continued with a talk by Félix Zamora, Vice Rector for Transfer, Innovation and Culture, and IFIMAC member, who provided valuable insights into knowledge transfer, highlighting strategies for bridging research and industry. This was followed by a roundtable discussion, where all attendees were invited to share perspectives on IFIMAC's future directions.

The event concluded with a poster session, showcasing the research conducted by PhD students at our center. This session provided a platform for young researchers to engage with colleagues and exchange ideas, reinforcing IFIMAC's commitment to fostering scientific excellence.

Research Projects

International R&D projects

1. **ANDREEV QUBITS FOR SCALABLE QUANTUM COMPUTATION - ANDQC.**
   Reference: GA 828948.
   Funding Institution: European Commission.
   Period: 01/04/2019 - 31/03/2024.
   PI: Levy Yeyati, Alfredo.

2. **DEVELOPMENT OF OPERANDO TECHNIQUES AND MULTISCALE MODELLING TO FACE THE ZERO-EXCESS SOLID-STATE BATTERY CHALLENGE - OPERA.**
   Reference: GA 101103834.
   Funding Institution: European Commission.
   Period: 01/06/2023 - 31/05/2026.
   PI: Polop Jordá, Celia.

3. **ENGINEERED CARRIER TRANSPORT IN NANOSTRUCTURED SEMICONDUCTORS USING FUNCTIONAL DISORDER - ENVISION.**
   NEW
   Reference: GA 101125962.
   Funding Institution: European Commission.
   Period: 01/04/2024 - 31/03/2029.
   PI: Prins, Ferry.

4. **FUTURE DATA STORAGE USING COLLOIDAL MEMORY TECHNOLOGY - FASTCOMET.**
   Reference: GA 101130615.
   Funding Institution: European Commission.
   Period: 01/11/2023 - 31/10/2026.
   PI: Delgado Buscalioni, Rafael.

5. **IMPROVING THE SUSTAINABILITY OF THE EUROPEAN MAGNETIC FIELD LABORATORY - ISABEL.**
   Reference: GA 871106.
   Funding Institution: European Commission.
   Period: 01/11/2020 - 31/10/2025.
   PI: Suderow Rodríguez, Hermann.

6. **INTEGRATIVE CHARACTERISATION OF NOVEL ADENOVIRUS VECTORS AIMED AT THERAPEUTIC APPLICATIONS - INVECTA.**
   Reference: GA 101129778.
   Funding Institution: European Commission.
   Period: 01/12/2023 - 30/11/2027.
   PI: Pablo Gómez, Pedro José.

7. **MAGNETOELECTRIC 3D PRINTING TECHNOLOGY - THE REVOLUTION OF ACTUATABLE COMPOSITES - EVA.**
   Reference: GA 101047081.
   Funding Institution: European Commission.
   Period: 01/10/2022 - 30/09/2026.
   PI: Zamora Abanades, Félix.

8. **MID-INFRARED QUANTUM TECHNOLOGY FOR SENSING - MIRAQLS.**
   Reference: GA 101070700.
   Funding Institution: European Commission.
   Period: 01/10/2022 - 30/09/2025.
   PI: Fernández Domínguez, Antonio I.

9. **NOTSOQUANTUM: REALISTIC SIMULATIONS OF POLARITONIC CHEMISTRY.**
   Reference: GA 101029384.
   Funding Institution: European Commission.
   Period: 01/09/2022 - 31/08/2025.
   PI: Feist, Johannes.

10. **QUANTUM INFORMATION SCIENCE AND ULTRAFAST NONLINEAR COHERENT CONTROL AT THE ATTOSECOND TIMESCALE - QU-ATTO.**
    NEW
    Reference: GA 101168628.
    Funding Institution: European Commission.
    Period: 01/09/2024 - 31/08/2028.
    PI: Palacios Cañas, Alicia and Martín García, Fernando.

11. **SCANNING PROBE MICROSCOPY IN HIGH VECTORIAL MAGNETIC FIELDS: NEW DEVICE FOR IMAGING QUANTUM MATERIALS - VECTORFIELDIMAGING.**
    Reference: GA 101069239.
    Funding Institution: European Commission.
    Period: 01/06/2022 - 30/11/2024.
    PI: Guillamón Gómez, Isabel.

12. **STRONG-COUPLING-ENHANCED NANOPARTICLE ARRAY ORGANIC LIGHT EMITTING DIODE - SCOLED.**
    Reference: GA 101098813.
    Funding Institution: European Commission.
    Period: 01/05/2023 - 30/04/2026.
    PI: Feist, Johannes.

13. **SUPERCONDUCTING NANODEVICES AND QUANTUM MATERIALS FOR COHERENT MANIPULATION - SUPERQUMAP.**
    Reference: CA 21144.
    Funding Institution: European Commission.
    Period: 06/10/2022 - 05/10/2026.
    PI: Suderow Rodríguez, Hermann.

14. **THEORETICAL INVESTIGATION OF SURFACE PHONON POLARITON-BASED QUANTUM PHOTONIC CIRCUITS - PHONOLOGIQ.**
    Reference: GA 101067180.
    Funding Institution: European Commission.
    Period: 01/10/2022 - 30/09/2024.
    PI: Fernández Domínguez, Antonio I.

15. **TIME-VARYING NANOPHOTONICS FOR NEW REGIMES OF QED LIGHT-MATTER INTERACTIONS - TIMELIGHT.**
    NEW
    Reference: GA 101115792.
    Funding Institution: European Commission.
    Period: 01/10/2024 - 30/09/2029.
    PI: Arroyo Huidobro, Paloma.

National R&D Projects

1. **ACELERANDO LA TRANSICIÓN DIGITAL CON NANOFOTÓNICA CUÁNTICA: PLATAFORMAS.**
   Reference: TED2021-130552B-C21.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 01/12/2022 - 30/11/2024.
   PI: Martín Cano, Diego and Fernández Domínguez, Antonio I.

2. **ACREDITACIÓN A UNIDADES DE EXCELENCIA MARÍA DE MAEZTU.**
   NEW
   Reference: CEX2023-001316-M.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 01/04/2024 - 31/03/2028.
   PI: Pérez Pérez, Rubén.

3. **ACTIVACIÓN DE GASES DE EFECTO INVERNADERO PARA APLICACIONES DE ENERGÍA LIMPIA: UN ESTUDIO COMBINADO DE HACES MOLECULARES Y XPS.**
   Reference: PID2023-147466OB-C21.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 01/09/2024 - 31/08/2027.
   PI: Farías Tejerina, Daniel.

4. **ACTIVATION OF GREENHOUSE GASES FOR CLEAN ENERGY FUELS: A COMBINED MOLECULAR BEAMS AND XPS STUDY.**
   Reference: TED2021-130446B-I00.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 01/12/2022 - 30/11/2024.
   PI: Farías Tejerina, Daniel.

5. **CANALIZACIÓN DE ENERGÍA EN SEMICONDCUTORES NANOESTRUCTURADOS.**
   Reference: PID2022-141579OB-I00.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 01/09/2023 - 31/08/2026.
   PI: Prins, Ferry.

6. **CARACTERIZACIÓN DE EXCITACIONES ÓPTICAS EN MATERIALES 2D CON RESOLUCIÓN ATÓMICA.**
   Reference: PID2021-128011NB-I00.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 01/09/2022 - 31/08/2025.
   PI: López Vázquez De Parga, Amadeo and Otero Martín, Roberto.

7. **CENTRO DE INVESTIGACIÓN DE FÍSICA DE LA MATERIA CONDENSADA (IFIMAC).**
   NEW
   Reference: CEX2018-000805-M.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 16/12/2019 - 30/06/2024.
   PI: García Vidal, Francisco.

8. **CONEXIÓN ENTRE ÓPTICA CUÁNTICA Y NANOFOTÓNICA.**
   Reference: EUR2023-143478.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 01/12/2023 - 30/11/2025.
   PI: Feist, Johannes.

9. **CONFIGURACIÓN DE LA ESTRUCTURA ELECTRÓNICA DE MATERIALES 2D: FOTORRESPUESTA Y PROPIEDADES DE ESPÍN.**
   Reference: PID2021-123295NB-I00.
   Funding Institution: Agencia Estatal de Investigación.
   Period: 01/09/2022 - 31/08/2025.
   PI: García Michel, Enrique.

10. **CONTROL A LA NANOESCALA DE NUEVAS PROPIEDADES INCORPORADAS AL GRAFENO: SUPERCONDUCTIVIDAD, MAGNETISMO Y GAP ELECTRÓNICO.**
    Reference: PID2020-115171GB-I00.
    Funding Institution: Agencia Estatal de Investigación.
    Period: 01/09/2021 - 31/08/2024.
    PI: Brihuega Alvarez, Iván.

11. **CONTROL QUÍMICO DE REDES METAL-ORGÁNICAS DE ZIRCONIO PARA LA CAPTURA Y DETECCIÓN ÓPTICA DE CONTAMINANTES AMBIENTALES.**
    Reference: PID2021-123839OB-I00.
    Funding Institution: Agencia Estatal de Investigación.
    Period: 01/09/2022 - 31/08/2025.
    PI: Platero Prats, Ana Eva.

12. **CONTROLANDO ÁTOMO A ÁTOMO LOS DISPOSITIVOS DE GRAFENO.**
    NEW
    Reference: PID2023-149106NB-I00.
    Funding Institution: Agencia Estatal de Investigación.
    Period: 01/09/2024 - 31/08/2027.
    PI: Brihuega Alvarez, Iván.

13. **CORRELACIONES CUÁNTICAS E INTERFERENCIA DE FOTONES INTERACTÚANTES EN ESTRUCTURAS MATERIA-LUZ BIDIMENSIONALES.**
    Reference: PID2020-113415RB-C22.
    Funding Institution: Agencia Estatal de Investigación.
    Period: 01/09/2021 - 31/08/2025.
    PI: Marchetti, Francesca María and Valle Reboul, Elena del.

14. **CORRIENTES DE CALOR EN LA ESCALA NANOMÉTRICA: FLUCTUACIONES Y EFECTOS NO LINEALES.**
    Reference: PID2022-142911NB-I00.
    Funding Institution: Agencia Estatal de Investigación.
    Period: 01/09/2023 - 31/08/2025.
    PI: Sánchez Rodrigo, Rafael.

15. **CUÁNTICA.**
    NEW
    Reference: PID2023-150420NB-C31.
    Funding Institution: Agencia Estatal de Investigación.
    Period: 01/09/2024 - 31/08/2027.
    PI: Marchetti, Francesca María and Valle Reboul, Elena del.

16. **DEFECTOS Y TRANSPORTE TÉRMICO DE MATERIALES 2D EN LA NANOESCALA.**
    NEW
    Reference: CNS2023-143713.
    Funding Institution: Agencia Estatal de Investigación.
    Period: 01/04/2024 - 30/06/2026.
    PI: Ares García, Pablo.

17. **DEFORMACIÓN DEL MATERIAL Y DINÁMICA EXCITÓNICA.**
Reference: CNS2022-135803.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/07/2023 - 30/06/2025.
PI: Picón Álvarez, Antonio.

18. **DESCIFRANDO LAS PROPIEDADES MAGNÉTICAS DE SISTEMAS BASADOS EN NANOHILOS Y NANOPARTÍCULAS PARA IMANES PERMANENTES.**
Reference: TED2021-130957B-C55.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 31/05/2025.
PI: Jaafar Ruiz-Castellanos, Miriam and Burzurí Linares, Enrique.

19. **DINÁMICA DE ATTOSEGUNDOS INDUCIDA POR LUZ XUV Y DE RAYOS X EN ÁTOMOS Y MOLÉCULAS EN FASE GAS.**
Reference: PID2022-138288NB-C32.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Palacios Cañas, Alicia.

20. **DINÁMICA ELECTRÓNICA Y TÉCNICAS ULTRARRÁPIDAS.**
Reference: PID2021-126560NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Picón Álvarez, Antonio.

21. **TRANSPORTE DE ESPÍN Y RUIDO EN ANTIFERROMAGNÉTICOS EPITAXIALES Y OTROS SISTEMAS NOVEDOSOS PARA PROCESAMIENTO ULTRARRÁPIDO Y POCO DISIPATIVO DE SEÑALES.**
Reference: PID2021-124585NB-C32.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Aliev Kazanski, Farkhad.

22. **DISEÑO DE MATERIALES 2D PARA APLICACIONES EN ENERGÍA II: DISEÑO Y PROCESABILIDAD.**
Reference: PID2022-138908NB-C31.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Zamora Abanades, Félix.

23. **DISPOSITIVOS ÓPTICOS BASADOS EN PATRONES DE NANOPARTÍCULAS PARA APLICACIONES NOVEDOSAS EN TECNOLOGÍAS DE DETECCIÓN SOSTENIBLES.**
NEW
Reference: PID2023-151078OB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2024 - 31/08/2027.
PI: Hernando Pérez, Mercedes.

24. **DOTACIÓN ADICIONAL JUAN DE LA CIERVA - GUILLERMO LÓPEZ-POLÍN PEÑA.**
Reference: IJC2020-042755-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/03/2022 - 28/02/2025.
PI: López-Polín Peña, Guillermo.

25. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL - AKASHDEEP KAMRA KAMRA.**
Reference: RYC2021-031063-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/01/2023 - 31/05/2024.
PI: Kamra, Akashdeep.

26. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL - ASSENZA, SALVATORE.**
NEW
Reference: RYC2022-037744-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/01/2024 - 31/12/2028.
PI: Assenza, Salvatore.

27. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL - HÉCTOR GONZÁLEZ HERRERO.**
Reference: RYC2021-031050-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/01/2023 - 31/12/2025.
PI: González Herrero, Héctor.

28. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL - LÓPEZ-POLÍN PEÑA, GUILLERMO.**
NEW
Reference: RYC2023-044003-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2024 - 30/11/2029.
PI: López-Polín Peña, Guillermo.

29. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL - MARTÍNEZ GALERA, ANTONIO JAVIER.**
NEW
Reference: RYC2022-038197-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/01/2024 - 31/12/2028.
PI: Martínez Galera, Antonio J.

30. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL - MERCEDES HERNANDO PÉREZ.**
Reference: RYC2021-030929-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/01/2023 - 31/12/2025.
PI: Hernando Pérez, Mercedes.

31. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL - PALOMA ARROYO HUIDOBRO.**
Reference: RYC2021-031568-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 21/03/2028.
PI: Arroyo Huidobro, Paloma.

32. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL. ANA EVA PLATERO PRATS.**
Reference: RYC2018-024328-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/11/2020 - 02/01/2026.
PI: Platero Prats, Ana Eva.

33. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL. DIEGO MARTÍN CANO.**
Reference: RYC2020-029730-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/05/2022 - 30/04/2027.
PI: Martín Cano, Diego.

34. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL. ENRIQUE BURZURÍ LINARES.**
Reference: RYC2019-028429-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 03/01/2027.
PI: Burzurí Linares, Enrique.

35. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL. JUAN LUIS ARAGONÉS GÓMEZ.**
Reference: RYC2019-028189-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/05/2021 - 30/04/2026.
PI: Aragonés Gómez, Juan Luis.

36. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL. LAURA RODRÍGUEZ ARRIAGA.**
Reference: RYC2018-025575-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/01/2020 - 31/12/2024.
PI: Rodríguez Arriaga, Laura.

37. **DOTACIÓN ADICIONAL RAMÓN Y CAJAL. PABLO ARES GARCÍA.**
Reference: RYC2020-030302-I.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/03/2022 - 28/02/2027.
PI: Ares García, Pablo.

38. **ECOSISTEMA SIESTA DE TÉCNICAS DE SIMULACIÓN DE MATERIALES (SIESTA-UAM).**
Reference: PID2022-139776NB-C64.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Soler Torroja, Jose María and Álvarez Carrera, José Vicente.

39. **ELECTRÓNICA COHERENTE EN DISPOSITIVOS SUPERCONDUCTORES.**
Reference: PID2020-117992GA-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 31/08/2025.
PI: Burset Atienza, Pablo.

40. **ELECTRÓNICA CUÁNTICA COHERENTE SUPERCONDUCTORA.**
Reference: CNS2022-135950.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2025.
PI: Burset Atienza, Pablo.

41. **EMISORES Y CONTROLADORES DE LUZ CUÁNTICA.**
NEW
Reference: PID2023-148061NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2024 - 31/08/2027.
PI: Antón Solanas, Carlos and Viña Liste, Luis.

42. **ENHANCING THE MECHANICAL STABILITY OF INTERFACES IN SOLID-STATE LI-ION BATTERIES FOR ENERGY-INTENSIVE APPLICATIONS.**
Reference: PCI2022-132998 (plan MRR).
Funding Institution: Agencia Estatal de Investigación.
Period: 01/05/2022 - 30/04/2025.
PI: Polop Jordá, Celia.

43. **ESTRATEGIAS DE DESACOPLO PARA LA CARACTERIZACIÓN DE SUPERCONDUCTORES 2D EN CONDICIONES CASI IDEALES.**
Reference: PID2020-116619GA-C22.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 31/08/2024.
PI: Martínez Galera, Antonio J.

44. **ESTUDIOS COMPUTACIONALES DE MATERIALES BIOMOLECULARES Y BIOINSPIRADOS.**
Reference: PID2021-125604NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Zotti, Linda Ángela and Ortega Mateo, José.

45. **EXPLORANDO INTERACCIÓN Y FUERZAS LUZ-MATERIA EN REDES COMPLEJAS DE PARTÍCULAS.**
Reference: PID2022-137569NB-C43.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Marqués Ponce, Manuel.

46. **EXPLORANDO LOS DETERMINANTES FÍSICOS Y ESTRUCTURALES DE LA DESACTIVACIÓN DE VIRUS INDIVIDUALES SOBRE SUPERFICIES: ATRAPAMIENTO, BIOMECÁNICA Y DESEMPAQUETAMIENTO GENÓMICO.**
Reference: PID2021-126608OB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Pablo Gómez, Pedro José.

47. **FABRICACIÓN ADITIVA DE MATERIALES POROSOS.**
Reference: PDC2022-133498-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/11/2024.
PI: Zamora Abanades, Félix.

48. **FUNDAMENTOS MICROSCÓPICOS DEL MICROSCOPIO DE FUERZAS ATÓMICAS Y MICROBALANZAS DE CUARZO PARA SENSAR BIOMOLÉCULAS.**
Reference: PID2020-117080RB-C51.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 30/04/2025.
PI: Tarazona Lafarga, Pedro and Delgado Buscalioni, Rafael.

49. **GRAFENO Y MATERIALES BIDIMENSIONALES PARA APLICACIONES EN ENERGÍA LIMPIA.**
Reference: PID2019-109525RB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/06/2020 - 29/02/2024.
PI: Farías Tejerina, Daniel.

50. **HACIA SUPERCONDUCTORES DE ALTA TEMPERATURA Y CAMPO CRÍTICO: MANIPULANDO Y COMPRENDIENDO CORRELACIONES ELECTRÓNICAS EN DOS DIMENSIONES.**
NEW
Reference: PID2023-150148OB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2024 - 31/08/2027.
PI: Suderow Rodríguez, Hermann and Guillamón Gómez, Isabel.

51. **HACIA UN NUEVO QUBIT DE SHIBA BASADO EN PUNTOS CUÁNTICOS HÍBRIDOS SUPERCONDUCTOR-SEMICONDUCTOR.**
Reference: TED2021-130292B-C41.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/09/2025.
PI: Levy Yeyati, Alfredo.

52. **HERRAMIENTAS DE SIMULACIÓN Y APRENDIZAJE AUTOMÁTICO PARA LA CARACTERIZACIÓN DE LA ESTRUCTURA Y LA RESPUESTA MECÁNICA DE MATERIALES AVANZADOS Y BIOMOLÉCULAS.**
NEW
Reference: PID2023-149150OB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2024 - 31/08/2027.
PI: Assenza, Salvatore and Pérez Pérez, Rubén.

53. **IDENTIFICACIÓN QUÍMICA Y CONTROL DE LAS PROPIEDADES ELECTRÓNICAS Y MECÁNICAS DE SISTEMAS MOLECULARES MEDIANTE MICROSCOPIAS DE PROXIMIDAD Y APRENDIZAJE AUTOMÁTICO.**
Reference: PID2020-115864RB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 31/08/2024.
PI: Pou Bell, Pablo and Pérez Pérez, Rubén.

54. **INFLUENCIA DE LA NANOESTRUCTURACIÓN EN LAS PROPIEDADES MECANOQUÍMICAS DE CÁTODOS COMPOSITE ZERO-STRAIN PARA BATERÍAS DE ION LI DE ESTADO SÓLIDO.**
Reference: PID2021-124667OB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Polop Jordá, Celia.

55. **INGENIERÍA CUÁNTICA DE LUZ Y MATERIA EN LA NANOESCALA.**
Reference: PID2021-126964OB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Martín Cano, Diego and Fernández Domínguez, Antonio I.

56. **INTEGRACIÓN MONOLÍTICA DE MATERIALES HÍBRIDOS FERROELÉCTRICOS/PLASMÓNICOS/2D PARA NANOFOTÓNICA INTEGRADA.**
Reference: PID2022-137444NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Ramírez Herrero, Mariola and Bausá López, Luisa E.

57. **INTERACCIÓN ENTRE MECANISMOS FÍSICOS Y MOLECULARES EN LA REGULACIÓN DE LA FORMACIÓN DE LA RETINA DE VERTEBRADOS.**
Reference: PID2022-140421NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Gómez Míguez, David.

58. **MAGNÓNICA CUÁNTICA PARA ESPINTRÓNICA EN EL LÍMITE 2D.**
Reference: PID2022-140923NB-C22.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2027.
PI: Burzurí Linares, Enrique.

59. **MANIPULAR LA MATERIA MEDIANTE LAS FLUCTUACIONES DEL VACÍO.**
Reference: PID2021-125894NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Feist, Johannes and García Vidal, Francisco.

60. **MATERIALES CON ORDENAMIENTO FERROELÉCTRICO Y ANTIFERROMAGNÉTICO PARA APLICACIONES ESPINTRÓNICAS ULTRARRÁPIDAS Y CONTROLABLES ELÉCTRICAMENTE.**
Reference: PID2021-122980OA-C53.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Velez Centoral, Saül.

61. **MATERIALES NO CENTROSIMÉTRICOS DE BAJA DIMENSIONALIDAD: TEORÍA Y EXPERIMENTOS.**
Reference: PID2022-141712NB-C21.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Rubio Bollinger, Gabino and Palacios Burgos, Juan José.

62. **MATERIALES PARA LA INFORMACIÓN CUÁNTICA BASADOS EN EXCITONES EN SEMICONDUCTORES.**
Reference: PID2020-113445GB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 31/08/2024.
PI: Martín Fernández, María Dolores.

63. **MATERIALES POROSOS AVANZADOS EN SEPARACIONES ENERGÉTICAS DE BAJA ENERGÍA DE GASES DE INTERÉS MEDIOAMBIENTAL.**
Reference: TED2021-129886B-C42.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 31/08/2025.
PI: Zamora Abanades, Félix.

64. **MATERIALES TISULARES BASADOS EN VESÍCULAS: RESPUESTAS COLECTIVAS EMERGENTES BAJO CAMPOS ELÉCTRICOS.**
NEW
Reference: CNS2023-145460.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/04/2024 - 30/06/2026.
PI: Rodríguez Arriaga, Laura.

65. **MATERIALES TOPOLÓGICOS PARA FOTOVOLTAICA.**
Reference: TED2021-131323B-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/09/2025.
PI: Rubio Bollinger, Gabino and Palacios Burgos, Juan José.

66. **MATERIALES Y SENSORES CUÁNTICOS MEDIANTE IMPLANTACIÓN DE IONES A MEV.**
Reference: PID2021-127498NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2022 - 31/08/2025.
PI: Ramos Ruiz, Miguel Ángel.

67. **MECÁNICA DEL CALOR: UNIENDO TRANSPORTE DE CALOR Y FRICCIÓN EN LA NANOESCALA.**
Reference: TED2021-132219A-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/09/2025.
PI: Ares García, Pablo.

68. MEDIOS CON VARIACIÓN TEMPORAL PARA ELECTRODINÁMICA CLÁSICA Y CUÁNTICA.
Reference: PID2022-141036NA-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Arroyo Huidobro, Paloma.

69. MICRO-ROBOTS AUTÓNOMOS CON CAPACIDAD DE DETECCIÓN.
Reference: CNS2023-145447.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/04/2024 - 30/06/2026.
PI: Aragonés Gómez, Juan Luis.

70. MICROSCOPÍAS DE BARRIDO A BAJAS TEMPERATURAS EN CAMPOS MAGNÉTICOS VECTORIALES.
Reference: PDC2021-121086-I00.
Funding Institution: Agencia Estatal de Investigación
Period: 01/12/2021 - 30/11/2024.
PI: Suderow Rodríguez, Hermann and Guillamón Gómez, Isabel.

71. NANODISPOSITIVOS FOTÓNICOS DE ESTADO SÓLIDO OBTENIDOS POR COMBINACIÓN DE EMISORES DE TIERRAS RARAS, NANOESTRUCTURAS PLASMÓNICAS Y MATERIALES 2D.
Reference: PID2019-108257GB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/06/2020 - 29/02/2024.
PI: Ramírez Herrero, Mariola and Bausá López, Luisa E.

72. NANOESTRUCTURAS HÍBRIDAS: DEL TRANSPORTE TÉRMICO A LOS DISPOSITIVOS CUÁNTICOS.
NEW
Reference: PID2023-150224NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2024 - 31/08/2027.
PI: Levy Yeyati, Alfredo.

73. NANOINGENIERÍA DE DISPOSITIVOS DE ESTADO SÓLIDO PARA COMPUTACIÓN NEUROMÓRFICA.
Reference: PID2020-116181RB-C31.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 31/08/2025.
PI: Camarero De Diego, Julio.

74. NUEVAS APLICACIONES CON FUENTES EXTREMAS DE LUZ.
NEW
Reference: CNS2023-145254.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/04/2024 - 30/06/2026.
PI: Feist, Johannes.

75. NUEVOS CONCEPTOS Y MÉTODOS PARA LA COMPRENSIÓN Y CARACTERIZACIÓN DE MATERIA CUÁNTICA TOPOLÓGICA FUERTEMENTE INTERACTUANTE.
Reference: PID2022-139995NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Bravo Abad, Jorge and Merino Troncoso, Jaime.

76. NUEVOS SUPERCONDUCTORES PARA TECNOLOGÍAS CUÁNTICAS: VISUALIZANDO Y MANIPULANDO CORRELACIONES TRIPLETE.
Reference: PID2020-114071RB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 31/12/2024.
PI: Suderow Rodríguez, Hermann and Guillamón Gómez, Isabel.

77. OPTIMIZACIÓN DE MATERIALES BIDIMENSIONALES PARA APLICACIONES EN ENERGÍA II: RECOLECCIÓN DE ENERGÍA MEDIANTE DISPOSITIVOS TERMO Y FLEXOELÉCTRICOS.
Reference: PID2022-138908NB-C32.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Gómez Herrero, Julio and López-Polín Peña, Guillermo.

78. OPTIMIZACIÓN DE NANOCATALIZADORES PARA ELECTRODOS DE CELDAS DE HIDRÓGENO.
Reference: TED2021-131788A-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/11/2024.
PI: Martínez Galera, Antonio J.

79. ORDEN Y AUTOENSAMBLAJE ENTRÓPICO EN FLUIDOS EN DOS DIMENSIONES.
NEW
Reference: PID2023-148633NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2024 - 31/08/2027.
PI: Cinacchi, Giorgio and Velasco Caravaca, Enrique.

80. OSCAR, AN OBJECT SEGMENTATION, COUNTER, ANALYSIS RESOURCE.
Reference: PDC2022-133147-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/09/2025.
PI: Gómez Míguez, David.

81. PESCANDO NANOPLÁSTICOS EN AGUA DESALINIZADA.
Reference: TED2021-129937B-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/11/2024.
PI: Hernando Pérez, Mercedes.

82. PLANTA DE LICUEFACCIÓN DE HELIO PARA LA CIENCIA Y TECNOLOGÍA CERCA DEL CERO ABSOLUTO.
Reference: EQC2021-007277-P.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/06/2021 - 31/12/2025.
PI: Suderow Rodríguez, Hermann.

83. PRODUCCIÓN DE HIDRÓGENO POR DISOCIACIÓN ELECTROQUÍMICA DE AGUA ASISTIDA POR FOTOCATALIZADORES CON CONTROL DE ESPÍN.
Reference: TED2021-131042B-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 31/07/2025.
PI: Miguel Llorente, Juan José.

84. PROPIEDADES FÍSICAS INTRÍNSECAS DE MATERIALES 2D EN LA NANOESCALA.
Reference: PID2022-142331NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Ares García, Pablo and Gómez-Navarro González, Cristina.

85. QUANTUM COMMUNICATIONS WITH BRIGHT SOLID-STATE SINGLE-PHOTON EMITTERS AT ROOM TEMPERATURE.
NEW
Reference: PCI2024-153425.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/07/2024 - 30/06/2027.
PI: Antón Solanas, Carlos.

86. QUIRALIDAD Y HELICIDAD EN LA NANOESCALA DESDE PRIMEROS PRINCIPIOS.
Reference: PID2019-109539GB-C43.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/06/2020 - 29/02/2024.
PI: Palacios Burgos, Juan José.

87. REACTIVIDAD ULTRARRÁPIDA EN LA NANOESCALA.
Reference: PID2022-138470NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2026.
PI: Díaz-Tendero Victoria, Sergio.

88. REDES METAL-ORGÁNICAS COMO PLATAFORMAS PARA LA DETECCIÓN DE CONTAMINANTES AMBIENTALES.
Reference: CNS2022-135261.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/07/2023 - 30/09/2025.
PI: Platero Prats, Ana Eva.

89. RETOS Y OPORTUNIDADES DE LAS TECNOLOGÍAS SUPERCONDUCTORAS EN LA AVIACIÓN COMERCIAL SIN EMISIONES DE GASES INVERNADERO.
Reference: TED2021-130546B-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/09/2025.
PI: Suderow Rodríguez, Hermann and Guillamón Gómez, Isabel.

90. SIMULACIÓN MULTIESCALA DE MATERIALES POROSOS AVANZADOS.
Reference: TED2021-129886B-C44.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 31/08/2025.
PI: Tarazona Lafarga, Pedro and Velasco Caravaca, Enrique.

91. SUPERANDO LA DIFUSIÓN: TRANSPORTE DINÁMICO EN MEDIOS COMPLEJOS.
Reference: PID2022-143010NB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2023 - 31/08/2027.
PI: Aragonés Gómez, Juan Luis and Rodríguez Arriaga, Laura.

92. SUPERCONDUCTIVIDAD EN LA NANOESCALA: DISPOSITIVOS CUÁNTICOS DE 0 A 2D.
Reference: PID2020-117671GB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 31/08/2025.
PI: Levy Yeyati, Alfredo.

93. TRANSPORTE DE CALOR Y TERMOELECTRICIDAD EN CONTACTOS MOLECULARES.
Reference: PID2020-114880GB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/09/2021 - 31/08/2024.
PI: Agraït de la Puente, Nicolás and Cuevas Rodríguez, Juan.

94. TRANSPORTE Y MANIPULACIÓN DEL CALOR EN EL RÉGIMEN CUÁNTICO.
Reference: PID2019-110125GB-I00.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/06/2020 - 31/01/2024.
PI: Sánchez Rodrigo, Rafael.

95. UNIONES JOSEPHSON BASADOS EN ACOPLAMIENTO ESPÍN-ÓRBITA PARA MEMORIAS CRIOGÉNICAS NO DISIPATIVAS.
Reference: TED2021-130196B-C22.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/09/2025.
PI: Aliev Kazanski, Farkhad.

96. VIRTUAL-QCM: SOFTWARE CIENTÍFICO PARA REPRODUCIR EXPERIMENTOS EN MICROBALANZAS DE CUARZO A PARTIR DE PRIMEROS PRINCIPIOS.
Reference: PDC2021-121441-C21.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2021 - 31/05/2024.
PI: Delgado Buscalioni, Rafael.

97. VISUALIZAR EL TRANSPORTE DE ENERGÍA EN SEMICONDUCTORES DESORDENADOS.
NEW
Reference: CNS2023-143577.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/04/2024 - 30/06/2026.
PI: Prins, Ferry.

98. VISUALIZING CARRIER INTERCONVERSION IN LAYERED PEROVSKITES.
Reference: TED2021-131018B-C21.
Funding Institution: Agencia Estatal de Investigación.
Period: 01/12/2022 - 30/11/2024.
PI: Prins, Ferry and Delgado Buscalioni, Rafael.

Regional R&D Projects

1. **AYUDA PARA LA REALIZACIÓN DE DOCTORADO INDUSTRIAL EN LA COMUNIDAD DE MADRID. DOCTORANDO CRISTINA ARQUEROS ALBAY. CONVOCATORIA 2020.**
   Reference: IND2020/IND-17321.
   Funding Institution: Comunidad de Madrid.
   Period: 05/02/2021 - 04/02/2024.
   PI: Zamora Abanades, Félix.

2. **AYUDA PARA LA REALIZACIÓN DE DOCTORADO INDUSTRIAL EN LA COMUNIDAD DE MADRID. DOCTORANDO EVA ORTIZ MANSILLA. CONVOCATORIA 2022.**
   Reference: IND2022/IND-23536.
   Funding Institution: Comunidad de Madrid.
   Period: 01/01/2023 - 31/12/2025.
   PI: Cuevas Rodríguez, Juan.

3. **CONVENIO ENTRE LA COMUNIDAD DE MADRID Y LA UNIVERSIDAD COMPLUTENSE DE MADRID PARA LA CONCESIÓN DE UNA SUBVENCIÓN DIRECTA PARA LA REALIZACIÓN DEL PROYECTO MATERIALES DISRUPTIVOS BIDIMENSIONALES (2D) DENTRO DEL PLAN COMPLEMENTARIO EN EL ÁREA DE MATERIALES AVANZADOS EN EL MARCO DEL COMPONENTE 17, INVERSIÓN 01 DEL PLAN DE RECUPERACIÓN, TRANSFORMACIÓN Y RESILIENCIA FINANCIADO POR LA UNIÓN EUROPEA NEXT GENERATION-EU POR IMPORTE DE 10.500.000 EUROS.**
   Reference: MAD-2D-CM.
   Funding Institution: Comunidad de Madrid.
   Period: 29/11/2022 - 31/12/2025.
   PI: López Vázquez De Parga, Amadeo.

4. **DOCTORADO INDUSTRIAL 2023 CM - DOCTORANDO MARTÍNEZ MUÑOZ, PATRICIA.**
   NEW
   Reference: IND2023/IND-27975.
   Funding Institution: Comunidad de Madrid.
   Period: 08/01/2024 - 07/01/2027.
   PI: Zamora Abanades, Félix.

5. **DOTACIÓN ADICIONAL CAPTACIÓN DE TALENTOS COMUNIDAD DE MADRID. PABLO BURSET ATIENZA.**
   Reference: 2019-T1/IND-14088.
   Funding Institution: Comunidad de Madrid.
   Period: 01/05/2020 - 30/04/2024.
   PI: Burset Atienza, Pablo.

6. **DOTACIÓN ADICIONAL CAPTACION DE TALENTOS COMUNIDAD DE MADRID. SAÜL VÉLEZ CENTORAL.**
   Reference: 2020-T1/IND-20041.
   Funding Institution: Comunidad de Madrid.
   Period: 01/01/2022 - 31/12/2026.
   PI: Velez Centoral, Saül.

7. **DOTACIÓN ADICIONAL TALENTO ANTÓN SOLANAS, CARLOS.**
   Reference: 2020-T1/IND-19785.
   Funding Institution: Comunidad de Madrid.
   Period: 25/02/2022 - 24/02/2027.
   PI: Antón Solanas, Carlos.

8. **DOTACIÓN ADICIONAL TALENTOS CM AÑO 5 - BURSET ATIENZA, PABLO.**
   NEW
   Reference: 2023-5A/IND-28927.
   Funding Institution: Comunidad de Madrid.
   Period: 01/05/2024 - 30/04/2025.
   PI: Burset Atienza, Pablo.

9. **EXCELENCIA PROFESORADO UNIVERSITARIO CATEDRÁTICO DE UNIVERSIDAD - FÍSICA DE LA MATERIA CONDENSADA.**
   Reference: UAM2020-A472CU.
   Funding Institution: Comunidad de Madrid.
   Period: 01/01/2020 - 31/12/2024.
   PI: Agraït de la Puente, Nicolás.

10. **EXCELENCIA PROFESORADO UNIVERSITARIO CATEDRÁTICO/A DE UNIVERSIDAD - FÍSICA DE LA MATERIA CONDENSADA.**
    Reference: UAM2020-A472CU.
    Funding Institution: Comunidad de Madrid.
    Period: 01/01/2021 - 31/12/2024.
    PI: Aliev Kazanski, Farkhad.

11. **EXCELENCIA PROFESORADO UNIVERSITARIO CATEDRÁTICO/A DE UNIVERSIDAD - QUÍMICA INORGÁNICA.**
    Reference: UAM2020-A475CU.
    Funding Institution: Comunidad de Madrid.
    Period: 01/01/2021 - 31/12/2024.
    PI: Zamora Abanades, Félix.

12. **EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR CONTRATADO DOCTOR - FÍSICA DE LA MATERIA CONDENSADA.**
    Reference: 2020-PCD028.
    Funding Institution: Comunidad de Madrid.
    Period: 01/01/2020 - 31/12/2024.
    PI: Agraït de la Puente, Nicolás.

13. **EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR CONTRATADO DOCTOR - FÍSICA TEÓRICA DE LA MATERIA CONDENSADA.**
    Reference: 2020-I3PCD024.
    Funding Institution: Comunidad de Madrid.
    Period: 01/01/2020 - 31/12/2024.
    PI: Levy Yeyati, Alfredo.

14. **EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR CONTRATADO DOCTOR - QUÍMICA.**
    Reference: 2020-I3PCD026.
    Funding Institution: Comunidad de Madrid.
    Period: 01/01/2020 - 31/12/2024.
    PI: Palacios Cañas, Alicia.

15. **EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR TITULAR DE UNIVERSIDAD - FÍSICA DE LA MATERIA CONDENSADA.**
    Reference: UAM2020-A470TU.
    Funding Institution: Comunidad de Madrid.
    Period: 01/01/2020 - 31/12/2024.
    PI: Agraït de la Puente, Nicolás.

16. **EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR/A CONTRATADO/A DOCTOR/A - FÍSICA TEÓRICA DE LA MATERIA CONDENSADA.**
    Reference: 2020-I3PCD024.
    Funding Institution: Comunidad de Madrid.
    Period: 01/01/2021 - 31/12/2024.
    PI: Valle Reboul, Elena del.

17. **EXCELENCIA PROFESORADO UNIVERSITARIO PROFESOR/A TITULAR DE UNIVERSIDAD - FÍSICA DE LA MATERIA CONDENSADA.**
Reference: UAM2020-A470TU.
Funding Institution: Comunidad de Madrid.
Period: 01/01/2021 - 31/12/2024.
PI: Otero Martín, Roberto.

18. **NANOFOTÓNICA PARA COMPUTACIÓN CUÁNTICA.**
Reference: Y2020/TCS-6545 (NanoQuCo-CM) Grupo: QNanoLight.
Funding Institution: Comunidad de Madrid.
Period: 01/07/2021 - 31/12/2024.
PI: García Vidal, Francisco.

Private Funding

1. **CONVENIO BANCO SANTANDER-UAM-IFIMAC.**
Reference: Santander Universidades.
Funding Institution: Banco De Santander Central Hispano SA.
Period: 18/06/2016 - 31/12/2024.
PI: García Vidal, Francisco.

2. **DISTRIBUCIÓN CUÁNTICA DE CLAVES CON EMISORES DE FOTONES A TEMPERATURA AMBIENTE.**
Reference: LEO23-1-8740.
Funding Institution: Fundación BBVA.
Period: 19/05/2023 - 19/11/2024.
PI: Antón Solanas, Carlos.

3. **FUENTES ULTRABRILLANTES DE FOTONES EN CAVIDADES ABIERTAS (ULTRA-BRIGHT).**
Reference: ULTRA-BRIGHT.
Funding Institution: Fundación Ramón Areces.
Period: 14/04/2023 - 14/04/2026.
PI: Antón Solanas, Carlos.

UAM Funding

1. **COMPLEJIDAD EN FÍSICA DE LA MATERIA CONDENSADA.**
Reference: UAM2023-UAM/201.
Funding Institution: Universidad Autónoma de Madrid.
Period: 06/10/2023 - 31/12/2026.
PI: García Michel, Enrique.

2. **DOTACIÓN PARA PROYECTO ANAEL BEN ASHER PARA PROJECT COST - CIVIS 3I.**
Funding Institution: Servicio de Investigación UAM.
Period: 01/11/2022 - 31/10/2024.
PI: Feist, Johannes.

3. **DOTACIÓN PARA PROYECTO DE EDOUARDOS LOUKOPOULOS PARA RESEARCH COST CIVIS 3I.**
Funding Institution: Servicio de Investigación UAM.
Period: 16/12/2023 - 15/12/2025.
PI: Platero Prats, Ana Eva.

4. **DOTACIÓN PARA PROYECTO DE RUTH ELENA TICHAUER PARA RESEARCH COST - CIVIS 3I.**
Funding Institution: Servicio de Investigación UAM.
Period: 01/11/2023 - 31/10/2025.
PI: Feist, Johannes.

5. **EMERGENCIA Y COMPLEJIDAD EN FÍSICA DE LA MATERIA CONDENSADA.**
Reference: UAM/179.
Funding Institution: Universidad Autónoma de Madrid.
Period: 15/06/2022 - 31/12/2026.
PI: Gómez Herrero, Julio and Agraït de la Puente, Nicolás.

6. **FÍSICA VIROLÓGICA CON AFM Y FLUORESCENCIA: DESEMPAQUETAMIENTO DE CARGO Y ÁCIDOS NUCLEICOS.**
NEW
Reference: UAM/240.
Funding Institution: Universidad Autónoma de Madrid.
Period: 01/10/2024 - 30/09/2028.
PI: Pablo Gómez, Pedro José.

7. **INCENTIVO PARTICIPACIÓN PROYECTOS EUROPEOS CELIA POLOP.**
NEW
Reference: UAM/217.
Funding Institution: Universidad Autónoma de Madrid.
Period: 20/05/2024 - 19/05/2025.
PI: Polop Jordá, Celia.

8. **INCENTIVO PARTICIPACIÓN PROYECTOS EUROPEOS HÉCTOR GONZÁLEZ.**
NEW
Reference: UAM/222.
Funding Institution: Universidad Autónoma de Madrid.
Period: 20/05/2024 - 19/05/2025.
PI: González Herrero, Héctor.

9. **INCENTIVO PARTICIPACIÓN PROYECTOS EUROPEOS PABLO ARES.**
NEW
Reference: UAM/234.
Funding Institution: Universidad Autónoma de Madrid.
Period: 20/05/2024 - 19/05/2025.
PI: Ares García, Pablo.

10. **INCENTIVO PARTICIPACIÓN PROYECTOS EUROPEOS SALVATORE ASSENZA.**
NEW
Reference: UAM/237.
Funding Institution: Universidad Autónoma de Madrid.
Period: 20/05/2024 - 19/05/2025.
PI: Assenza, Salvatore.

11. **MATERIALES DISRUPTIVOS BIDIMENSIONALES (2D) - MAD2DCM.**
Reference: UAM/187.
Funding Institution: Universidad Autónoma de Madrid.
Period: 01/03/2023 - 30/06/2025.
PI: López Vázquez De Parga, Amadeo.

12. **MEDIDAS DE TORQUE MAGNÉTICO EN MUESTRAS BASADAS EN METALES LIGEROS.**
NEW
Reference: UAM/215.
Funding Institution: Universidad Autónoma de Madrid.
Period: 01/06/2024 - 31/05/2026.
PI: Velez Centoral, Saül.

13. **PROPIEDADES ÓPTICAS DE EXCITONES EN SEMICONDUCTORES.**
Reference: UAM/160.
Funding Institution: Universidad Autónoma de Madrid.
Period: 01/01/2021 - 14/01/2026.
PI: Viña Liste, Luis.

14. **SIMULACIÓN COMPUTACIONAL DE BIOMOLÉCULAS Y MATERIA BLANDA.**
Reference: UAM2023-UAM/203.
Funding Institution: Universidad Autónoma de Madrid.
Period: 01/10/2023 - 30/06/2024.
PI: Ortega Mateo, José.

15. **TRANSPORTE DE PORTADORES DISEÑADO EN SEMICONDUCTORES NANOESTRUCTURADOS UTILIZANDO DESORDEN FUNCIONAL.**
NEW
Reference: UAM2024-UAM/244.
Funding Institution: Universidad Autónoma de Madrid.
Period: 01/09/2024 - 31/08/2027.
PI: Prins, Ferry.

16. **TRANSPORTE ELECTRÓNICO A TRAVÉS DE BIOMOLÉCULAS.**
Reference: UAM/127.
Funding Institution: Universidad Autónoma de Madrid.
Period: 06/03/2019 - 31/12/2026.
PI: Zotti, Linda Ángela.

17. **UAM2023-UAM/208 | RUBÉN PÉREZ PÉREZ | GESTIÓN DE I+D ASOCIADA A LAS ACTIVIDADES DE INVESTIGACIÓN, SOLICITUDES DE PROYECTOS Y EJECUCIÓN DE LOS VIGENTES.**
Reference: UAM/208.
Funding Institution: Universidad Autónoma de Madrid.
Period: 01/01/2024 - 31/12/3000.
PI: Pérez Pérez, Rubén.

18. **USO DE MICROSCOPIA DE CAMPOS MAGNÉTICOS EXTREMOS PARA VISUALIZAR MATERIALES CON CORRELACIONES ELECTRÓNICAS.**
NEW
Reference: UAM/117.
Funding Institution: Universidad Autónoma de Madrid.
Period: 01/09/2018 - 30/06/2026.
PI: Guillamón Gómez, Isabel.

Publications

1. Abad-Arredondo, J; Fernández-Domínguez, AI. (2024). Electron-assisted probing of polaritonic light-matter states. **NANOPHOTONICS**, 13(11). DOI:10.1515/nanoph-2023-0907

2. Abad-Arredondo, J; Geng, Z; Keijsers, G; Bijloo, F; García-Vidal, FJ; Fernández-Domínguez, AI; Rodriguez, SRK. (2024). Spontaneous Symmetry Breaking in Diffraction. **PHYSICAL REVIEW LETTERS**, 133(13). DOI:10.1103/PhysRevLett.133.133803

3. Acciai, M; Tesser, L; Eriksson, J; Sanchez, R; Whitney, RS; Splettstoesser, J. (2024). Constraints between entropy production and its fluctuations in nonthermal engines. **PHYSICAL REVIEW B**, 109(7). DOI:10.1103/PhysRevB.109.075405

4. Aguilar-Galindo, F; Nguyen, VTT; Singh, R; Domaracka, A; Huber, BA; Diaz-Tendero, S; Rousseau, P; Maclot, S. (2024). Unexpected and delayed fragmentation dynamics of the organometallic ferrocene induced by ion-collision. **PHYSICAL CHEMISTRY CHEMICAL PHYSICS**, 26(9). DOI:10.1039/d3cp05430f

5. Al Taleb, A; Vines, F; Farías, D. (2024). Suppression of Elastic Scattering of CH4 by Graphene Passivation of Ni(111). JOURNAL OF **PHYSICAL CHEMISTRY** C, 128(49). DOI:10.1021/acs.jpcc.4c06132

6. Alagappan, G; García-Vidal, FJ; Png, CE. (2024). Fabry-Perot Resonances in Bilayer Metasurfaces. **PHYSICAL REVIEW LETTERS**, 133(22). DOI:10.1103/PhysRevLett.133.226901

7. Aldave, DA; López-Polín, G; Calle, E; Begué, A; Ranchal, R; Martínez, R; Bran, C; Burzurí, E; Gómez-Herrero, J; Ares, P; Jaafar, M. (2024). Magnetic Field Screening of 2D Materials Revealed by Magnetic Force Microscopy. **ADVANCED ELECTRONIC MATERIALS**. DOI:10.1002/aelm.202400607

8. Alemán, J; Humbrías-Martín, J; del Río-Rodríguez, R; Aguilar-Galindo, F; Díaz-Tendero, S; Fernández-Salas, JA. (2024). Bicarbonate-binding catalysis for the enantioselective desymmetrization of keto sulfonium salts. **NATURE COMMUNICATIONS**, 15(1). DOI:10.1038/s41467-024-48832-x

9. Alexander, O; Egun, F; Rego, L; Gutierrez, AM; Garratt, D; Cardenes, GA; Nogueira, JJ; Lee, JP; Zhao, KX; Wang, RP; Ayuso, D; Barnard, JCT; Beauvarlet, S; Bucksbaum, PH; Cesar, D; Coffee, R; Duris, J; Frasinski, LJ; Huse, N; Kowalczyk, KM; Larsen, KA; Matthews, M; Mukamel, S; O'Neal, JT; Penfold, T; Thierstein, E; Tisch, JWG; Turner, JR; Vogwell, J; Driver, T; Berrah, N; Lin, MF; Dakovski, GL; Moeller, SP; Cryan, JP; Marinelli, A; Picón, A; Marangos, JP.(2024). Attosecond impulsive stimulated X-ray Raman scattering in liquid water. **SCIENCE ADVANCES**, 10(39). DOI:10.1126/sciadv.adp0841

10. Alvarado, M; Yeyati, AL; Aguado, R; Souto, RS. (2024). Interplay between Majorana and Shiba states in a minimal Kitaev chain coupled to a superconductor. **PHYSICAL REVIEW B**, 110(24). DOI:10.1103/PhysRevB.110.245144

11. Andrino-Gómez, A; Moratalla, M; Redondo-Cubero, A; Gordillo, N; Ramos, MA. (2024). Low-temperature electrical conductivity of ion-beam irradiated Bi-Sb films. **LOW TEMPERATURE PHYSICS**, 50(5). DOI:10.1063/10.0025622

12. Arqueros, C; Welte, L; Montoro, C; Zamora, F. (2024). Imine-based covalent organic framework gels for efficient removal of Fe2+ from contaminated water. **JOURNAL OF MATERIALS CHEMISTRY A**, 12(31). DOI:10.1039/d4ta00954a

13. Arrachea, L; Yeyati, AL; Balseiro, CA. (2024). Signatures of triplet superconductivity in v=2 chiral Andreev states. **PHYSICAL REVIEW B**, 109(6). DOI:10.1103/PhysRevB.109.064519

14. Arteaga, K; Feist, J; Jelovina, D; Martin, F; Palacios, A. (2024). Strong Electron-Electron-Nuclei Correlations in Two-Photon Double Ionization of H2. **PHYSICAL REVIEW LETTERS**, 133(12). DOI:10.1103/PhysRevLett.133.123201

15. Arvelo, DM; Garcia-Sacristan, C; Chacón, E; Tarazona, P; Garcia, R. (2024). Interfacial water on collagen nanoribbons by 3D AFM. **JOURNAL OF CHEMICAL PHYSICS**, 160(16). DOI:10.1063/5.0205611

16. Ast, CR; Kot, P; Ismail, M; de-la-Peña, S; Fernández-Domínguez, AI; Cuevas, JC. (2024). Theory of electron spin resonance in scanning tunneling microscopy. **PHYSICAL REVIEW RESEARCH**, 6(2). DOI:10.1103/PhysRevResearch.6.023126

17. Ayani, CG; Bosnar, M; Calleja, F; Solé, AP; Stetsovych, O; Ibarburu, IM; Rebanal, C; Garnica, M; Miranda, R; Otrokov, MM; Ondrácek, M; Jelínek, P; Arnau, A; de Parga, ALV. (2024). Unveiling the Interlayer Interaction in a 1H/1T TaS2 van der Waals Heterostructure. **NANO LETTERS**, 24(35).DOI:10.1021/acs.nanolett.4c02068

18. Ayani, CG; Pisarra, M; Ibarburu, IM; Garnica, M; Miranda, R; Calleja, F; Martin, F; de Parga, ALV. (2024). Probing the Phase Transition to a Coherent 2D Kondo Lattice. **SMALL**, 20(8). DOI:10.1002/smll.202303275

19. Ayani, CG; Pisarra, M; Ibarburu, IM; Rebanal, C; Garnica, M; Calleja, F; Martin, F; de Parga, ALV. (2024). Electron delocalization in a 2D Mott insulator. **NATURE COMMUNICATIONS**, 15(1). DOI:10.1038/s41467-024-54747-4

20. Bahamon, DA; Gómez-Santos, G; Efetov, DK; Stauber, T. (2024). Chirality Probe of Twisted Bilayer Graphene in the Linear Transport Regime. **NANO LETTERS**, 24(15). DOI:10.1021/acs.nanolett.4c0037

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Invited lectures

1. Advanced Atomic Force Microscopy: a tool for Nanoscience and Nanotechnology. **14th Early Stage Researchers Workshop in Nanoscience (IMDEA Nanociencia)**. (17/12/2024). Madrid. Pablo Ares.

2. A glance of recent applications to explore attosecond electron dynamics & Time Management. **Mildred Dresselhaus Jubilee 2024**. (14/03/2024). Hamburg. Alicia Palacios.

3. A Tale of Two Photons. **Physics of Light-Matter Coupling in Nanostructures (PLMCN 2024)**. (09/04/2024). Tbilisi (Georgia). Elena del Valle.

4. Attosecond pump-probe spectroscopy. Theoretical methods for the description of correlated electron and nuclear dynamics. **"Light & Matter" Series at King's College London (UK)**. (29/11/2024). London. Alicia Palacios.

5. Attosecond pump-probe spectroscopy: Theoretical methods for the description of correlated electron and nuclear dynamics. **'Women Extreme Meetings' 2024**. (28/11/2024). Salamanca. Alicia Palacios.

6. Attosecond pump-probe spectroscopy: Theoretical methods for the description of correlated electron and nuclear dynamics. **28th International Conference on Atomic Physics (ICAP-28)**. (14/07/2024). Imperial College London, London. Alicia Palacios.

7. Bridging the scales in molecular biophysics via multipronged theoretical approaches. **European South Atlantic Biophysics Congress**. (05/06/2024). San Sebastián. Salvatore Assenza.
8. Charge Imabalance Polaritons. **Condensed Matter and Quantum Materials 2024** (CMQM 2024). (02/07/2024). University of St Andrews, Scotland. Francesca Maria Marchetti.
9. Combining ferroelectrics, plasmonic nanostructures and 2D materials for application in nanophotonics. **XXII Brazilian Material Research Society Meeting**. (30/09/2024). Santos (SP, Brazil). Luisa E. Bausá.
10. Confined spin dynamics: from sensing exchange coupling to application in artificial neuron. **SolSkyMag2024**. (24/06/2024). San Sebastián. Farkhad Aliev.
11. Controlling the dynamics of magnetic domain walls and skyrmions by magnetic exchange coupling and pinning. **9th International Conference on Superconductivity and Magnetism & 2nd International Conference on Quantum Materials and Technologies**. (29/04/2024). Fethiye (Turkey). Saül Vélez.
12. Crossover from isolated ysr states to gapless superconductivity in 2h-nbse2-xsx at the atomic scale. **International Workshop Emerging Quantum Materials based on Superconducting Nanostructures**. (02/10/2024). Chisinau. Jose Antonio Moreno.
13. Effects of the van der Waals interaction on the formation of wrinkles in 2D materials. **2nd International Forum on Semiconductors and Optoelectronics (SEMICONFORUM2024)**. (12/08/2024). Online. Pablo Ares.
14. Effects of the van der Waals interaction on the formation of wrinkles in 2D materials. **3rd Conference in Advanced Materials in Spain (AMatS 2024)**. (12/11/2024). Valladolid. Pablo Ares.
15. Electron Transport through Metal-Protein-Metal Junctions. **II Workshop on Advanced quantum phenomena in 2D and carbon-based materials**. (23/10/2024). Alicante. Linda A. Zotti.
16. Electronically-probed strong coupling of hybrid nanostructures. **Light and Matter Interactions, LMI2024**. (24/09/2024). Madrid. Antonio I. Fernández Domínguez.
17. Equal Spin Triplets and Enhanced Thermoelectric Effect in Superconductor-Ferromagnet Hybrids with Symmetry Filtering and Spin Orbit Coupling. **Workshop "Quantum Materials"**. (13/05/2024). Cristalera-Miraflores de la Sierra, Madrid. Farkhad Aliev.
18. Exploring the Use of Antiaromatic Compounds in Single Molecule Circuits. **Closing the Gaps: Advancing Single-Molecule Electronics in Electronic Engeneering**. (05/09/2024). Turin. Linda A. Zotti.
19. From Spintronics to Orbitronics. **2024 Workshop on Magnetism: Current Research on Magnetism and Magnetic Materials**. (19/11/2024). Sevilla. Saül Vélez.
20. Integration of ferroelectrics, plasmonic nanostrucures and 2D materials for application in nanophotonics. **8th International Conference on Advanced Spectroscopy and Optical Materials IWASOM'24**. (07/07/2024). Gdansk. Luisa E. Bausá.
21. Interface driven magnon dynamics in antiferromagnet-ferromagnet and superconductor-ferromagnet hybrids. **CMD31 EPS conference**. (02/09/2024). Braga. Farkhad Aliev.
22. Ionizing radiation as an efficient catalyst to trigger unexpected chemical processes. **HCI2024 – 21st Highly Charged Ions Conference**. (02/09/2024). Egmond aan Zee (The Netherlands). Sergio Díaz-Tendero.
23. Joule spectroscopy as a tool for the characterization of hybrid superconductor-semiconductor nanodevices. **International Conference "Quantum Sensing"**. (06/06/2024). Paris. Eduardo Lee.
24. Magnetic control of electrically uncharged magneto-optical particles. **AES2024**. (25/06/2024). Roma. Manuel Marqués.
25. Magnetic control of electrically uncharged magneto-optical particles. **META 2024**. (15/07/2024). Toyama. Manuel Marqués.
26. Magnetic control of electrically uncharged magneto-optical particles. **Nanospain2024**. (04/06/2024). Tarragona. Manuel Marqués.
27. Magneto-optical Particles in Isotropic Spinning Fields Mimic Magnetic Monopoles. **MOST 2024**. (08/10/2024). Samarcand. Manuel Marqués.
28. Molecular simulation of the mechanical work exerted by Hsp70 chaperones. **CECAM Workshop on "Modeling energy-consuming biomolecular processes"**. (22/01/2024). Lausanne. Salvatore Assenza.
29. Multiple and colorful photons. **Multiphotonics (2024)**. (04/07/2024). Munich. Elena del Valle.
30. Nanofabrication for light control in two dimensions. **XXXIX Reunión Bienal de la Real Sociedad Española de Física**. (15/07/2024). San Sebastián. Saül Vélez.
31. Non-Hermitian Photon Blockade for antibunched light and Free electron probing of polaritonic states. **Photoptics 2024**. (22/02/2024). Rome. Antonio I. Fernández-Domínguez.
32. Peptide bonds formation in clusters of amino acids induced by ionizing radiation. **MPS2024 – International Conference on Many Particle Spectroscopy of Atoms, Molecules, Clusters and Surfaces**. (23/04/2024). Shanghai. Sergio Díaz-Tendero.

33. Polariton condensates' dynamics in low dimensional heterostructures. **Sino-Spanish Symposium on Advanced Materials for Nanotechnology and Optoelectronic**s. (03/10/2024). Miraflores de la Sierra. M. Dolores Martín.

34. Polaritonic chemistry from micrometer to nanometer scales. **ACS Spring Meeting 2024**. (19/03/2024). New Orleans. Johannes Feist.

35. Polariton-mediated modification of material properties. **Polariton Science Conference**. (06/06/2024). Odense. Johannes Feist.

36. Probing & tuning Fermi polaron polaritons. **1st Australian workshop on Quantum Light Information Matter and Electronics (QLIME)**. (10/12/2024). Pullman Albert Park Melbourne. Francesca Maria Marchetti.

37. Quantum nanophotonics: antibunched light, modulated electron probing, and emitter entanglement. **Sino-Spanish Symposium on Advanced Materials for Nanotechnology and Optoelectronics**. (02/10/2024). Madrid. Antonio I. Fernández-Domínguez.

38. Quantum optics with organic molecules. **Seminar DIPC**. (10/12/2024). San Sebastián. Diego Martín Cano.

39. Rolling vesicles as tribological tools. **10th Iberian Meeting on Colloids and Interfaces - RICIX**. (24/06/2024). Coimbra. Laura R. Arriaga.

40. Rolling vesicles as tribological tools. **Seminarios del Instituto de Química Física Blas Cabrera**. (09/10/2024). Madrid. Laura R. Arriaga.

41. Scanning-Probe-Assisted Nanowire Circuitry. **9th European Nanomanipulation Workshop**. (17/06/2024). Miraflores de la Sierra, Madrid. Pablo Ares.

42. Scanning tunneling microscopy at very low temperatures in heavy fermions. **SUPERMAX. International Workshop on Superconductivity & Magnetism in f-Electron Quantum Materials under Extreme Conditions**. (14/10/2024). Toulouse. Hermann Suderow.

43. Strong electron-electron-nuclei correlations in multiphoton double ionization. **'Ultrafast Dynamic Imaging of Matter' (UFDIM 2024)**. (18/11/2024). Hamburg. Alicia Palacios.

44. Tailoring the optical properties of 2d materials via ferroelectric substrates. **7th International Conference on Physics of Optical Materials and Devices (ICOM2024)**. (26/08/2024). Budva-Becici. Mariola O Ramírez.

45. The feedback driven atomic scale Josephson microscope. **International Conference "Quantum sensing"**. (04/06/2024). Paris. Jose Antonio Moreno.

46. Theoretical methods for the description of correlated electron and nuclear dynamics at the attosecond time scale. **27th European Theoretical Spectroscopy Facility (ETSF) Workshop on Electronic Excitations**. (03/06/2024). Marseille. Alicia Palacios.

47. Theoretical methods for the description of XUV and X-Ray induced ultrafast electron dynamics in gas phase targets. **WavemiX ("Wave mixing in the EUV and X-ray") annual workshop**. (08/07/2024). Madrid. Alicia Palacios.

48. Theory of single and multiphoton emission from quantum systems. **Berlin School of Optical Sciences and Quantum Technologies (BOS.QT)**. (16/07/2024). Schloßhotel Fleesensee. Elena del Valle.

49. Tuning quantum emission with frequency filtering and homodyning. **International Conference Laser Optics (ICLO 2024)**. (01/07/2024). St Petersburg. Elena del Valle.

50. Two Photons everywhere. **International Conference on the Physics of Excitons and Polaritons in Semiconductors (PEPS 2024). (06/08/2024)**. Reykjavík. Elena del Valle.

51. Exploring the Use of Antiaromatic Compounds in Single Molecule Circuits. **IEEE- Nano2024**. (08/07/2024). Gijón. Linda A. Zotti.

52. Electron Transport through Metal-Protein-Metal Junctions. **IEEE- Nano2024**. (08/07/2024). Gijón. Linda A. Zotti.

53. Two-photon double ionization of H2 with sub-femtosecond laser pulses. **Conference of the European Group on Atomic Systems**. (16/06/2024). Granada. Alicia Palacios.

54. Using cavities to modify material properties. **A Symposium on Science at ITAMP**. (17/05/2024). Cambridge, MA, EEUU. Johannes Feist.

55. Using cavities to modify material properties. **Quantum Technologies for Young Researchers workshop QTYR24**. (10/07/2024). Madrid. Johannes Feist.

56. Using quantized light in new regimes. **What does the future hold for AMO theory?** (17/10/2024). Cambridge, MA, EEUU. Johannes Feist.

57. Visualizing electronic correlations in quantum materials at very low temperatures. **European Microscopy Conference EMC2024**. (25/08/2024). Copenhagen. Hermann Suderow.

58. When ionizing radiation elicits unforeseen processes: dynamics beyond the coulomb explosion. **DAMOP2024 – 55th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics**. (03/06/2024). FortWorth, Texas. Sergio Díaz-Tendero.

59. XUV and X-ray induced ultrafast electron dynamics in gas-phase targets: attosecond spectroscopy. **Sino-Spanish Symposium on Advanced Materials for Nanotechnology and Optoelectronics**. (04/10/2024). Miraflores de la Sierra, Madrid. Alicia Palacios.

Organization of congresses

1. **2nd Spanish Soft Matter 1 1/2 Day** (03/11/2024, Benasque). Organizers: J.L. Aragonés (IFIMAC-UAM), L.R. Arriaga (IFIMC-UAM), A. Fernández-Nieves (UB - ICREA), M. Ruiz-García (UCM).
2. **7th International Conference on the Physics of Optical Materials and Devices-ICOM 24** (26/08/2024, Montenegro). Organizers: Luisa E. Bausá.
3. **8th International Workshopo on Advanced Spectroscopy and optical Materials IWASOM'24** (07/07/2024, Gdansk). Organizers: Luisa E. Bausá.
4. **Complex Nanophotonics Science Camp** (30/07/2024, Cumberland Lodge, Windsor Great Park) Organizers: Paloma Arroyo Huidobro, David Phillips, Sabrina Simoncelli and Arthur Goestchy.
5. **Correlations and topology in quantum materials** (21/01/2024, Bad Honneff). Organizers: Leni Bascones, Hermann Suderow and Roser Valentí.
6. **European School on Superconductivity and Magnetism in Quantum Materials** (21-25th of April, Valencia). Organizers: José J. Baldoví, José Lado, Francesco Tafuri and Hermann Suderow.
7. **III International conference on Novel 2D materials explored via scanning probe microscopy & spectroscopy** (24/06/2024, San Sebastián). Organizers: Iván Brihuega and Miguel Moreno Ugeda.
8. **International Conference Quantum sensing** (4-6 June 2024, Paris). Organizers: Cheryl Feuillet-Palma, Dimitri Roditchev and Céline Roux-Byl, Preden Roulleau, Hermann Suderow and Francesco Tafuri.
9. **ICACC 2025: Symposium on Crystalline Materials for electrical, optical and medical applications** (28/01/2024, Daytona Beach FL). Organizers: K. Shimamura, L. E. Bausá and N. Cherepy.
10. **International Workshop Emerging Quantum Materials based on Superconducting Nanostructures** (02/10/2024, Moldova). Organizers: L. Culiuc V. M., Fomin N., Siminel, Y. Anahory, A. Crişan, O. Dobrovolskiy, V. M. Fomin, W. Lang, P. Samuely, A. V. Silhanek, H. Suderow and J. Van den Vondel.
11. **MOST 2024, Optical Forces Session** (08/10/2024, Samarcand). Organizers: Manuel Ignacio Marqués Ponce.
12. **Multiphotonics** (04/07/2024, Munich). Organizers: Munich, Elena del Valle and Kai Müller.
13. **Photorefractive Photonics and Beyond 2024: interaction of light with matter (PR´24)** (02/07/2024, San Lorenzo del Escorial). Organizers: Mercedes Hernando Pérez.
14. **School on "Ultrafast phenomena in Chemistry: Laser-matter interactions at the femto- and atto- second time scales**." (20/05/2024, Zaragoza). Organizers: Alicia Palacios and Felipe Zapata.
15. **Symposium "Molecular Biophysics" within the XXXIX Biennal Meeting of the Spanish Royal Physical Society (RSEF)** (15/07/2024, San Sebastián). Organizers: Linda A. Zotti and Salvatore Assenza.
16. **Universal themes in Bose-Einstein Condensation** (04/11/2024, Trento). Organizers: Corinna Kollath, David Snoke, Francesca Marchetti, Gabriele Ferrari, Iacopo Carusotto, Michiel Wouters, Nick Proukakis, Peter Littlewood, Stefano Giorgini and Thierry Giamarchi.

Sponsorships

1. **2nd Spanish Soft Matter** (Benasque, 3th to 6th November 2024) organized by IFIMAC-UAM, UB-ICREA and UCM. More information: https://www.benasque.org/2024ssm/
2. **9th European Nanomanipulation Workshop** (Madrid, 17th to 19th June 2024) organized by IFIMAC-UAM, ICMM-CSIC and UCM. More information: https://sites.google.com/ucm.es/9nanoman
3. **XXXIX Reunión Bienal de la Real Sociedad Española de Física** (San Sebastian, 15th to 19th July 2024) organized by RSEF and UPV/EHU. More information: https://bienalfisica.org/en/home
4. **Complex nanophotnics Science Camp** (the Cumberland Lodge, Windsor, 30th of July to 2nd of August 2024) organized by IFIMAC-UAM, University of Exeter, ESPCI Paris and University of Buenos Aires. More information: https://www.sciencecamp.eu/
5. **Novel 2D materials explored via scanning probe microscopy & spectroscopy** (San Sebastian, 24th to 28th June 2024) organized by IFIMAC-UAM, DIPC and GV/EJ. More information: https://2dspm.dipc.org/
6. **Photorefractive Photonics and Beyond (PR24): Interaction of Light with Matter** (Madrid, 2nd to 5th July 2024) organized by IFIMAC-UAM, UPM and CSIC. More information: https://pr24.opelaf.com/
7. **QUANTUMatter 2024** (San Sebastian, 7th to 10th May 2024) organized by Phantoms Foundation. More information: https://www.quantumconf.eu/2024/
8. **Universal themes on Bose-Einstein condensation** (Trento, 4th to 9th November 2024) organized by IFIMAC-UAM, CNR-INO, Universitá di Trento and BEC.

Patent applications

1. **A computer implemented method for identifying a organic molecule from atomic force microscopy images by generating a 2D colored rgb structural representation of said molecule in the form of a ball-and-stick depiction.**
   Rubén Pérez Pérez and Jaime Carracedo Cosme.
   Year: 2024
   Application number: PCT/ES2023/070275
   Countries: India, Japan, China, US and Europe
   UAM

2. **A computer implemented method for identifying a molecule from atomic force microscopy images and generating the name of said molecule according to the IUPAC nomenclature.**
   Rubén Pérez Pérez, Jaime Carracedo Cosme.
   Year: 2024
   Application number: PCT/ES2023/070276
   Countries: India, Japan, China, US and Europe
   UAM

3. **Dispositivo de redireccionamiento de haz múltiple basado en nanoantenas ópticas plasmónicas.**
   Manuel Marqués Ponce, María Carmen Vázquez García and Alicia Fresno Hernández.
   Year: 2024
   Application number: 202430474
   UAM and UC3M

Awards

Ranking of the World Scientists: World Top 2% Scientists by Stanford University

16.47% IFIMAC researchers are among the most influential in the world, following the publication of the latest edition of the "Ranking of the World Scientists: World Top 2% Scientists," compiled by Stanford University and the consulting firm Elsevier.

More information: https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/7

IFIMAC Receives Medals at CaixaForum Madrid for its María de Maeztu Accreditations

On the 5th of September, a ceremony was held at CaixaForum Madrid to honour the recipients of the Severo Ochoa and María de Maeztu accreditations. The event, which brought together representatives of all the institutes and centres that have received accreditation over the last six years, was presided over by the Minister of Science, Innovation and Universities, Diana Morant. Professor Francisco J. García-Vidal and Professor Rubén Pérez, former and current directors of IFIMAC, were honoured with medals in recognition of the Institute's second accreditation (2018) and third accreditation (2023).

News link: https://www.ciencia.gob.es/Noticias/2024/Septiembre/acto-centros-unidades-excelencia.html

Emeritus Professor Fernando Flores receives the "Medalla de la Universidad Autónoma de Madrid"

On 21 November 2024, Fernando Flores Sintas, Emeritus Professor at the UAM since 2009, was awarded the Medal of the Autonomous University of Madrid (UAM), the institution's highest honour. This award recognises his remarkable academic and scientific career, marked by significant contributions to condensed matter physics and nanoscience. His research has covered a wide range of topics, including organic materials, nanoscience and many-body physics.

With a legacy of over 400 scientific publications, 27 supervised PhD theses and leadership of numerous research projects, Flores Sintas has left a lasting impact on his field. He was also instrumental in the creation of the Institute of Condensed Matter Physics (IFIMAC) at the UAM, further cementing his influence as a leading figure in the scientific community.

News link: https://www.uam.es/uam/noticias/acto-solemne-medalla-fernando-flores-2024

Prof. Francisco José García-Vidal receives the Miguel Catalán Award 2024

Professor Francisco José García-Vidal was officially honoured with the Miguel Catalán Prize, awarded by the Community of Madrid for the year 2024. The ceremony took place on 21 January 2025 at the Real Casa de Correos, the headquarters of the Presidency of the Comunidad de Madrid. This prestigious award recognises his groundbreaking contributions to nanophotonics, plasmonics and metamaterials, and cements his reputation as one of the most influential physicists of the last decade.

News link: https://www.comunidad.madrid/noticias/2025/01/21/comunidad-madrid-estrenara-programa-contratacion-estable-cientificos-primer-nivel

5 TRAINING ACTIVITIES

- Predoctoral Fellowships Program of the Spanish AEI
- Master and Doctorate Programs
- IFIMAC's Master Grants
- Research Awards for Physics Students

IfiMAC
Condensed Matter Physics Center

Predoctoral Fellowships Program of the Spanish AEI

Through the María de Maeztu Unit of Excellence approved in 2024, IFIMAC has secured six FPI grants. In 2024, two positions were announced, and the selected students will join us in January 2025.

Call resolution:

RESOLUCIÓN DE 6 DE NOVIEMBRE DE 2024 DE LA RECTORA DE LA UNIVERSIDAD AUTÓNOMA DE MADRID POR LA QUE SE RESUELVE LA CONVOCATORIA PÚBLICA DE 2 CONTRATOS PREDOCTORALES PARA LA FORMACIÓN DE DOCTORES CORRESPONDIENTES A LAS ACTUACIONES PARA LA FORMACIÓN DE PERSONAL INVESTIGADOR PREDOCTORAL DEL CENTRO DE INVESTIGACIÓN DE FÍSICA DE LA MATERIA CONDENSADA, ENMARCADAS EN LA CONVOCATORIA DE CONCESIÓN DE ACREDITACIONES Y AYUDAS PÚBLICAS DE «CENTROS DE EXCELENCIA SEVERO OCHOA» Y DE «UNIDADES DE EXCELENCIA MARÍA DE MAEZTU», EN EL MARCO DEL PLAN ESTATAL DE INVESTIGACIÓN CIENTÍFICA, TÉCNICA Y DE INNOVACIÓN 2021-2023.

Por Resolución de 1 de octubre de 2024 se efectuó la convocatoria pública de 2 contratos predoctorales para la formación de doctores correspondientes a las actuaciones para la formación de personal investigador predoctoral del centro de investigación de física de la materia condensada, enmarcadas en la convocatoria de concesión de acreditaciones y ayudas públicas de «Centros de Excelencia Severo Ochoa» y de «Unidades de Excelencia María de Maeztu», en el marco del plan estatal de investigación científica, técnica y de innovación 2021-2023.

Finalizado el proceso de selección conforme a lo establecido en los apartados 2 y 5 de las bases de la Convocatoria y vista la propuesta formulada por la Comisión de Valoración, este Rectorado en uso de sus atribuciones conferidas en el artículo 50.1 de la Ley Orgánica del Sistema Universitario 2/2023, de Universidades y en particular por el artículo 40 de los Estatutos de la UAM, HA RESUELTO:

PROPONER COMO CANDIDATO/A TITULAR DE LA PLAZA 1º A, JAVIER CASTRO LUACES

PROPONER COMO CANDIDATO/A TITULAR DE LA PLAZA 2º A, TERESA ESPINOSA GONZÁLEZ

PROPONER COMO SUPLENTES A:
CHRISTOS PASPALIDES,
DOMINGO DE GUZMÁN ORERO GÁMEZ,
PABLO HERNÁNDEZ MARTÍN,
PAULA OBLADEN AGUILERA y
HAMEDI MEHDI

De no formalizar el contrato en plazo establecido, por causa imputable a el/la interesado/a, el/la candidata/a decaerá en su derecho.

Contra la presente Resolución, que pone fin a la vía administrativa, podrá interponerse recurso contencioso-administrativo ante los Juzgados de lo Contencioso-Administrativo de Madrid, en el plazo de dos meses desde el día siguiente a la fecha de su publicación. Sin perjuicio de lo anterior, la presente Resolución podrá ser recurrida potestativamente mediante recurso de reposición ante el Rector de esta Universidad en el plazo de un mes desde el día siguiente a dicha publicación. En este caso no podrá interponerse recurso contencioso-administrativo hasta que no sea resuelto expresamente o se haya producido la desestimación presunta del recurso de reposición interpuesto, de conformidad con lo dispuesto en los artículos 123 y 124 de la Ley 39/2015, de 1 de octubre, del Procedimiento Administrativo Común de las Administraciones Públicas.

Madrid, 6 de noviembre de 2024
LA RECTORA
P.D.: El Vicerrector de Política Científica,
(Resolución de 02/07/2021, BOCM de 08/07/2021)

Daniel Jaque García

Código Seguro De Verificación	[illegible]	Fecha	08/11/2024
Firmado Por	Daniel Jaque García - Vicerrector - Vicerrectorado de Política Científica (En funciones)		
Url De Verificación	[illegible]	Página	1/1

Master and Doctorate Programs

IFIMAC members are actively involved in the **Master Programs:**

- Máster Universitario en Física de la Materia Condensada y de los Sistemas Biológicos.
- Máster Universitario en Química Teórica y Modelización Computacional.
- Máster Universitario en Materiales Avanzados, Nanotecnología y Fotónica.
- Máster Universitario en Química Aplicada.

And in the **Doctorate Programs**:

- Física de la Materia Condensada, Nanociencia y Biofísica.
- Programa de Doctorado en Materiales Avanzados y Nanotecnología.
- Química Teórica y Modelización Computacional.
- Química Aplicada.

IFIMAC's Master Grants

IFIMAC has offered 10 grants for the best students starting the **Masters of Condensed Matter Physics** within UAM.

2023/2024 course: five Master Grants awarded.

Castro Luaces, Javier. TFM Supervisor: Merino, Javier and Bravo, Jorge

Gallego de Roa, Álvaro. TFM Supervisor: Díaz-Tendero, Sergio

Ronquillo Tutiven, Joan Javier TFM Supervisor: Cuevas Rodríguez, Juan Carlos and Vilhena, Guilherme

Torrico García-Viso, Lucía. TFM Supervisor: Zamora, Félix

Verde Ruiz, Miguel. TFM Supervisor: Feist, Johannes

More information: https://www.ifimac.uam.es/jobs-opportunities/ifimacs-master-grants-for-2023-2024/

2024/2025 course: five Master Grants awarded.

de la Fuente Pico, David. TFM Supervisor: Marchetti, Francesca

Planelles Prensa, Pablo. TFM Supervisor: Pou Bell, Pablo

Rodríguez Fernández, Asensio. TFM Supervisor: Picón, Antonio

Romero Sánchez, Lucía. TFM Supervisor: Brihuega, Iván

Sintes Pineda, Tomás Miguel. TFM Supervisor: Cuevas, Juan Carlos

More information: https://www.ifimac.uam.es/jobs-opportunities/ifimacs-master-grants-for-2024-2025/

Research Awards for Physics Students

The Condensed Matter Physics Center provides two of the six awards called by The Nicolás Cabrera Institute. The candidates awarded by IFIMAC in the 2024 edition are **Marcos Jiménez Larroy** and **Daniel Ruano Medina**.

More information: https://www.inc.uam.es/winners-research-awards-physics-students-2024/

6 OUTREACH ACTIVITIES

- Science outreach activities
- IFIMAC on Media
- Official visits to IFIMAC
- IFIMAC YouTube Channel
- IFIMAC Social Media

IfiMAC
Condensed Matter Physics Center

Science outreach activities

International Day of Women and Girls in Science

On February 10th, IFIMAC organized a science fair at the Faculty of Science, Cantoblanco UAM, to celebrate the International Day of Women and Girls in Science. The event featured a series of interactive workshops and attracted over 250 participants, offering them a unique opportunity to engage with condensed matter physics.

The primary objective of the fair was to foster curiosity and enthusiasm for science among the general public, including families with children. Additionally, this event highlights also the scientific contributions of women at IFIMAC and recognize the achievements of pioneering women in the history of science

2024's program included hands-on activities for participants of all ages, such as DNA extraction from a banana, battery construction, light manipulation, explorations in nanomaterials, investigations into low-temperature physics, and an introduction to quantum physics within a classical framework. Through these activities, attendees engaged directly with researchers, gaining insight into fundamental scientific concepts in an interactive and accessible manner.

In addition to the science fair, Arin Escobar Ortíz, PhD student at IFIMAC, gave a talk on "Simulations, physics in your laptop" at the IES Iturralde secondary school (Madrid) on 14 and 15 February.

Madrid Es Ciencia Fair

During our participation in the Madrid Es Ciencia Fair on 8 March, attendees had the opportunity to delve into the fundamental concepts of light trapping through an engaging workshop. They explored the physics of materials and how devices are developed to harness light, which is transforming modern technologies. By constructing two opposing mirrors, we created an infinite mirror effect, providing an analogy for the operation of an optical cavity. Additionally, we showcased a prototype from our laboratories, where we are investigating innovative materials that interact strongly with photons trapped in microcavities. This hands-on experience allowed participants to gain deeper insights into cutting-edge research in the field of light manipulation.

Workshop CEIP Virgen del Rosario in Soto del Real

On 31 May, Elena del Valle and Arianna Barreto Padrón organized a workshop for 4-7-year-old students aimed to nurture the students' natural curiosity about the world, guiding them to observe and understand phenomena like sound and light. They encouraged the young learners to explore their environment in a scientific manner, teaching them to ask questions and seek answers.

The activity introduced the scientific method while covering fundamental concepts of waves, sound, and light. The students engaged with a variety of interactive tools, such as a water bath, strings, springs, musical instruments, bubbles, and prisms, creating an enriching and hands-on educational experience.

Workshops at Instituto de Libre Enseñanza (ILE)

As part of the ongoing collaboration with the Instituto de Libre Enseñanza of the Fundación Giner, a joint workshop was held in Madrid on 14 December. Beatriz Viña Bausá, a PhD student at IFIMAC, led an interactive session titled "Transforming Matter: Phase Transitions and Two-Dimensional Materials." Through hands-on experiments, participants explored the fundamental physics behind states of matter and 2D materials. This collaboration will continue with two additional workshops scheduled for early 2025.

European Researchers Night

IFIMAC researchers participated in the European Researchers Night 2024 organized by the Unidad de Cultura Científica at the UAM. This event was held on 27 September in the Plaza Mayor of the Cantoblanco Campus. IFIMAC´s activity "Cryolaboratory – Exploring the Magic of Extreme Cold," was led by a team of researchers and students, including Edwin Herrera, Héctor González, Pablo García, José A. Moreno, Óscar Bou, Paula Obladen, José David Bermúdez, Miguel Águeda, and Jaime Rumeu.

During the workshop, participants explored matter changes, observing the dramatic transformations of everyday objects such as flowers and fruit when immersed in liquid nitrogen (-196 °C). The activity also explored flash freezing to illustrate phase transitions and demonstrated how cryogenics has revolutionized transport through superconducting magnetic levitation. Additionally, attendees examined the properties of dry ice (solid CO_2) and learned about sublimation—transitioning directly from solid to gas—through a series of engaging experiments.

More information:

https://www.madrimasd.org/lanochedelosinvestigadores/actividad/uam-criolaboratorio-exploremos-la-magia-del-frio-extremo

Science and Innovation Week

IFIMAC participated in the XXIV Madrid Science and Innovation Week with 2 activities in the Community of Madrid through the Fundación para el Conocimiento Madri+d:

8 November 2024: The good vibes: a musical and luminous workshop

Led by Elena del Valle, Arianna Barreto, and Sofía Quiñonez, this workshop engaged participants in exploring the physics of light and sound through hands-on activities with musical instruments, water, strings, ropes, and other materials. By generating waves in different media, attendees gained a deeper understanding of wave behavior and its role in shaping the world around us. This activity was aimed at primary school students.

More information:

https://www.semanacienciamadrid.org/actividad/la-buena-onda-un-taller-musical-y-luminoso

8 November 2024: CrioPresiónLab: Exploring the Power of Extreme Cold and Pressure Changes

In the CrioPresiónLab workshop, aimed at students in secondary school, Héctor González, Edwin Herrera, Paula Obladen, Jaime Rumeu, José David Bermúdez, and Teresa García explored the effects of low temperatures, experimented with superconductors to achieve magnetic levitation, and observed phase transitions and gas dynamics using dry ice and liquid nitrogen. Additionally, they launched a table tennis ball at nearly the speed of sound using a vacuum cannon, offering a captivating and hands-on demonstration of physics in action. Participants also visited the laboratories of the Center for Condensed Matter Physics and saw some of the instruments we used daily in our research.

More information:

https://www.semanacienciamadrid.org/actividad/criopresionlab-explorando-el-poder-del-frio-extremo-y-los-cambios-de-presion

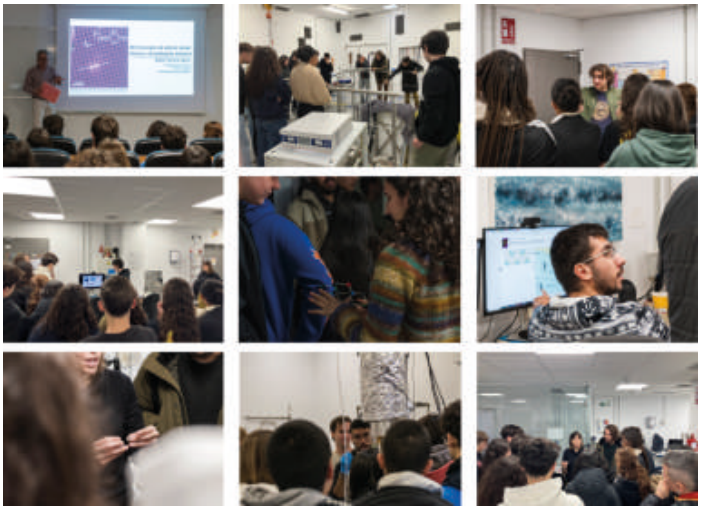
Exploring Condensed Matter Physics from Príncipe de Asturias School: Science Workshops with IFIMAC

Researchers from IFIMAC held a series of workshops on condensed matter physics for fifth and sixth grade students at the CEIP Príncipe de Asturias in Cantoblanco, made possible by the 2024 Cultural Transfer Grant from the UAM. Through the project "Exploring Condensed Matter Physics from Príncipe de Asturias School: Science Workshops with IFIMAC", we expanded our science outreach efforts and launched a new initiative aimed at engaging the primary education community in the Community of Madrid (CM). This pilot project included five engaging workshops: 1. The scientific method, a great ally, 2. What is matter made of, 3. The laws of motion, 4. Where do colours come from and 5. Science gives you wings.

Thanks to the support of the UAM Cultural Transfer Grant, our team was able to inspire scientific curiosity through hands-on activities, introduce young students to the fascinating field of condensed matter physics, and encourage critical thinking and a deeper understanding of the world around them.

IDEO School visits IFIMAC

On the 11th of December we received a visit from the IDEO School. This visit was a great opportunity to introduce the first year Bachillerato students to the fascinating world of atoms and Scanning Tunneling Microscopy (STM). Isabel Guillamón and Edwin Herrera guided the students through the evolution of research in the field, emphasising how these concepts have shaped modern science. By conducting experiments on semiconductors, the students gained hands-on experience that deepened their understanding of the subject. Their visit to the Condensed Matter Physics Department at IFIMAC allowed them to see first-hand the cutting-edge research taking place in different laboratories. Researchers Hector González, Beatriz Viña, José David Bermúdez, Diego Expósito, Pablo García, Roberto Carrasco, José Antonio Moreno and Óscar Bou were able to share their valuable research experience and demonstrate the real-world applications of their projects.



IFIMAC on Media

IFIMAC Newsletter

The IFIMAC Newsletter is a platform for sharing our activities, it strengthens the identity of our organization and provides regular updates on our achievements to the broader scientific community. This strategic communication approach enhances collaboration and cohesion among our team members. It also contributes to the dissemination of IFIMAC's accomplishments, fostering connections and knowledge exchange with the wider scientific community.

El Periódico: Interview with Cristina Gómez-Navarro

Cristina Gómez-Navarro talks about her career in the special issue of El Periódico on 13 February entitled "STEM Women". She highlights her research on graphene and a forthcoming collaboration at MIT, offering insights into her experiences and the challenges she faces in science and technology. Beyond her scientific work, she is committed to promoting gender diversity in physics and actively coordinates the mentoring program for women physics students at UAM. Her story underscores the importance of empowering women in STEM and serves as an inspiration for future generations.

Full Article:

https://www.elperiodico.com/es/sociedad/20240213/cristina-gomez-navarro-gusta-trabajar-98133860

Mujeres STEM:

https://www.ifimac.uam.es/wp-content/uploads/2024/02/mujeres_STEM_full.pdf

Official visits to IFIMAC

Mayors Official Visit to UAM – Visiting IFIMAC Labs

On 22 February, mayors, education councillors and representatives of the business and innovation sectors from the nearby towns of Alcobendas, San Sebastián de los Reyes, Tres Cantos and Colmenar Viejo - municipalities surrounding UAM - visited IFIMAC as part of the official mayors' tour of the university. The group was led by our Rector, Amaya Mendikoetxea, and the Vice Rector for Innovation and Knowledge Transfer, Félix Zamora. They had the opportunity to meet IFIMAC members Isabel Guillamón, Iván Brihuega, Ferry Prins and our Director, Rubén Pérez.

During the visit, Isabel Guillamón showcased her pioneering research, and the lab focused on tunneling microscopy under extreme conditions. The group also toured the Photonic Nanomaterials and Graphene & 2D Materials Labs, led by Ferry Prins and Iván Brihuega, gaining insights into nanophotonics and 2D materials research and the advanced instruments developed at IFIMAC.

News link:

https://www.ifimac.uam.es/ifimac-news/mayors-official-visit-to-uam-visiting-ifimac-labs/

Councilor for Education Emilio Viciana joins our CrioPresiónLab Workshop

Emilio Viciana Duro, Councilor for Education, Science, and Universities of the Community of Madrid, along with Ana Ramírez, Deputy Regional Minister of Universities; Marina Villegas, Director General of Research and Innovation; and Federico Morán, Director of Madri+d, visited our workshop "CrioPresiónLab: Exploring the Power of Extreme Cold and Pressure Changes" during the XXIV Madrid Science and Innovation Week. They actively participated in the activities alongside students from IES Gran Capitán, engaging firsthand with the experiments and demonstrations.

IFIMAC YouTube Channel

IFIMAC Colloquium

As part of our commitment to fostering engagement and knowledge exchange, we invite colloquium speakers to participate in an interview with four IFIMAC PhD students. This initiative provides a unique opportunity for our PhD students to interact directly with leading experts and gain valuable insights into both cutting-edge research and career development. Beyond these enriching discussions, the interviews serve as a platform to highlight the work of distinguished researchers and bring their perspectives to a wider audience. By sharing these conversations on the IFIMAC YouTube channel, we aim to create an accessible and inspiring resource for students, early-career researchers, and anyone interested in the latest advances in the field of condensed matter physics. This initiative strengthens our scientific community by encouraging dialogue, mentorship, and the dissemination of knowledge beyond academic circles.

Interviews:

Maia Vergniory: https://youtu.be/TiGV4FyvWYI
Susana Huelga: https://youtu.be/AR6iU3zGWRM
Florian Marquardt: https://youtu.be/QqbrNzOxl3s
Vahid Sandoghdar: https://youtu.be/VfxZY_7xs1s
Ludovic Berthier: https://youtu.be/8q91h75y4hM
Javier García de Abajo: https://youtu.be/pR06nASpRRg

ERC awards

Pablo Ares García discuss the goals and challenges of his ERC project, awarded by the European Research Council in 2024.

IFIMAC Social Media

In 2024, we continued our #CondensedMatterPioneers initiative using X and IFIMAC also launched an account on Bluesky to expand our social media presence.

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7. HUMAN RESOURCES

- New members proposed by IFIMAC Researchers
- IFIMAC Researchers
- IFIMAC Staff

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New members proposed by IFIMAC Researchers

NEW **Guillermo López-Polín Peña**

Guillermo López-Polín's research focuses on the mechanical and thermoelectric properties of 2D materials. He obtained his PhD at Universidad Autónoma de Madrid in 2016, receiving the extraordinary prize, and carried out a research stay at TU Delft during this period. After that, he joined the University of Manchester as a postdoctoral researcher, working on superconductivity and later on nanoscaled ripples in 2D materials. In 2018, he was awarded an Alexander von Humboldt Fellowship at the Free University of Berlin, where he studied the optical properties of transition metal dichalcogenides. He then returned to Madrid with a Juan de la Cierva Formación fellowship at ICMM-CSIC and later moved to UAM with a Juan de la Cierva Incorporación contract, which he held briefly before obtaining a position as Assistant Professor. At UAM, he combines his expertise in 2D materials to study their mechanical and thermoelectric properties. His expertise includes atomic force microscopy, device fabrication, and instrumentation. In 2023, he was awarded a Ramón y Cajal Fellowship.

IFIMAC Researchers

Surname and name	Professional category	Department	Research line/s
Agraït de la Puente, Nicolás	Catedrático de Universidad	FMC	NP
Aliev Kazanski, Farkhad	Catedrático de Universidad	FMC	AM
Alvarez Alonso, Jesús	Titular de Universidad	FMC	NP, AM
Álvarez Carrera, José Vicente	Titular de Universidad	FMC	FPSM, NP, SCMB
Antón Solanas, Carlos	Research Fellow CM-Talento	FM	AM, NQO
Aragonés Gómez, Juan Luis	Investigador RyC	FTMC	SCMB
Ares García, Pablo	Investigador RyC	FMC	AM, NP
Arroyo Huidobro, Paloma	Investigadora RyC	FTMC	NQO
Assenza, Salvatore	Investigador RyC	FTMC	SCMB
Bausá López, Luisa E.	Catedrática de Universidad	FM	AM, NQO
Bravo Abad, Jorge	Titular de Universidad	FTMC	NQO
Brihuega Álvarez, Iván	Titular de Universidad	FMC	AM, NP
Burset Atienza, Pablo	Research Fellow CM-Talento	FTMC	NP, AM
Burzurí Linares, Enrique	Investigador RyC	FMC	NP, AM
Camarero de Diego, Julio	Titular de Universidad	FMC	NP, AM
Cinacchi, Giorgio	Contratado Doctor	FTMC	SCMB, AM
Cuevas Rodríguez, Juan Carlos	Titular de Universidad	FTMC	NP, NQO
de Pablo Gómez, Pedro José	Titular de Universidad	FMC	SCMB, NP
Delgado Buscalioni, Rafael	Titular de Universidad	FTMC	SCMB

Surname and name	Professional category	Department	Research line/s
Díaz-Tendero Victoria, Sergio	Titular de Universidad	Q	FPSM
Farías Tejerina, Daniel	Catedrático de Universidad	FMC	NP
Feist, Johannes	Contratado Doctor	FTMC	NQO
Fernández Domínguez, Antonio Isaac	Titular de Universidad	FTMC	NQO
Flores Sintas, Fernando	Profesor Emérito	FTMC	NP, FPSM
García González, Pablo	Titular de Universidad	FTMC	FPSM, NQO
García Michel, Enrique	Catedrático de Universidad	FMC	AM, NP
García Mochales, Pedro	Contratado Doctor	FMC	FPSM
García Vidal, Francisco José	Catedrático de Universidad	FTMC	NQO
Gómez Herrero, Julio	Catedrático de Universidad	FMC	NP, AM
Gómez Santos, Guillermo	Titular de Universidad	FMC	FPSM
Gómez-Navarro González, Cristina	Titular de Universidad	FMC	AM, NP
González Herrero, Héctor	Investigador RyC	FMC	AM, NP
Guantes Navacerrada, Raúl	Titular de Universidad	FMC	SCMB
Guillamón Gómez, Isabel	Titular de Universidad	FMC	AM
Hernando Pérez, Mercedes	Investigadora RyC	FM	SCMB
Kamra, Akashdeep	Investigador RyC	FTMC	AM, NP
Lazic, Snezana	Contratado Doctor	FM	NP
Lee, Eduardo Jian Hua	Contratado Doctor	FMC	NP, AM
Levy Yeyati, Alfredo	Catedrático de Universidad	FTMC	NP, AM
López Vázquez de Parga, Amadeo	Catedrático de Universidad	FMC	NP
López-Polín Peña, Guillermo	Investigador RyC	FM	AM, NP
Marchetti, Francesca Maria	Titular de Universidad	FTMC	NQO
Marqués Ponce, Manuel	Titular de Universidad	FM	NQO
Martín Cano, Diego	Investigador RyC	FTMC	NQO
Martín Fernández, María Dolores	Titular de Universidad	FM	NQO
Martínez Galera, Antonio J.	Investigador RyC	FM	AM, NP
Merino Troncoso, Jaime	Titular de Universidad	FTMC	AM
Miguel Llorente, Juan José	Titular de Universidad	FMC	AM, NP
Míguez Gómez, David	Contratado Doctor	FMC	SCMB
Monreal Vélez, Rosa	Profesora Emérita	FTMC	NP, NQO
Moreno Soriano, Esteban	Titular de Universidad	FTMC	NQO
Mori Sánchez, Paula	Contratado Doctor	Q	FPSM
Ortega Mateo, José	Catedrático de Universidad	FTMC	AM, SCMB, NP, FPSM
Otero Martín, Roberto	Titular de Universidad	FTMC	AM, NP
Palacios Burgos, Juan José	Catedrático de Universidad	FMC	NP, FPSM
Palacios Cañas, Alicia	Titular de Universidad	Q	FPSM
Pérez Pérez, Rubén	Catedrático de Universidad	FTMC	NP, FPSM

Surname and name	Professional category	Department	Research line/s
Picón Álvarez, Antonio	Contratado Doctor	Q	NP, FPSM
Platero Prats, Ana Eva	Investigadora RyC	QI	AM
Polop Jordá, Celia	Titular de Universidad	FMC	AM, NP
Porto Ortega, Juan Antonio	Contratado Doctor	FTMC	NQO
Pou Bell, Pablo	Titular de Universidad	FTMC	FPSM, NP
Prins, Ferry	Profesor Permanente Laboral	FMC	NQO
Ramírez Herrero, Mariola	Contratado Doctor	FM	AM, NQO
Ramos Ruiz, Miguel Ángel	Catedrático de Universidad	FMC	AM, SCMB
Rodrigo Rodríguez, José	Titular de Universidad	FMC	AM
Rodríguez Arriaga, Laura	Investigadora RyC	FTMC	SCMB
Rubio Bollinger, Gabino	Catedrático de Universidad	FMC	NP, AM
Sánchez Rodrigo, Rafael	Contratado Doctor	FTMC	NP
Segovia Cabrero, Pilar	Titular de Universidad	FMC	AM, NP
Seijo Loché, Luis	Catedrático de Universidad	Q	FPSM
Soler Torroja, Jose María	Catedrático de Universidad	FMC	FPSM
Suderow Rodríguez, Hermann	Catedrático de Universidad	FMC	AM, NP
Tarazona Lafarga, Pedro	Catedrático de Universidad	FTMC	SCMB
Tejedor de Paz, Carlos	Profesor Emérito	FTMC	NQO
Valle Reboul, Elena del	Contratado Doctor	FTMC	NQO, NP
Van Der Meulen, Herko	Titular de Universidad	FM	AM, NQO
Velasco Caravaca, Enrique	Titular de Universidad	FTMC	SCMB
Vélez Centoral, Saül	Research Fellow CM-Talento	FMC	AM, NP
Vieira Díaz, Sebastián	Profesor Emérito	FMC	AM
Viña Liste, Luis	Catedrático de Universidad	FM	NQO
Yndurain Muñoz, Félix	Profesor Emérito	FMC	FPSM
Zamora Abanades, Félix	Catedrático de Universidad	QI	AM
Zotti, Linda Ángela	Ayudante Doctor	FTMC	NP, FPSM, SCMB

Acronyms

Departments
FMC: Física de la Materia Condensada
FTMC: Física Teórica de la Materia Condensada
FM: Física de Materiales
QI: Química Inorgánica
Q: Química

Research Lines
NP: Nanophysics
AM: Advanced Materials
SCMB: Soft Condensed Matter and Biophysics
FPSM: First-principles Simulations and Modeling
NQO: Nano and Quantum Optics

IFIMAC Staff

Surname and name	Profesional category
Bilan, Stefan	IT and High-Performance Computing Infrastructure
Fallaque Najar, Joel	IT and High-Performance Computing Infrastructure
Marqués Gallego, Patricia	Outreach
Nevado Rodríguez, Jesús	Laboratoty Technician
Sánchez Gil, Susana	Project Manager
Souto Pérez, Beatriz	Project Manager Assistant

8 BUDGET

IfiMAC
Condensed Matter Physics Center

GASTOS			INGRESOS	
Previsión de gastos de personal, gastos corrientes de funcionamiento y equipamiento e inversiones	a) Gastos de personal	**80,399.34€**	**Estimación de ingresos por actividad propia**	**572,624.14€**
	b) Gastos corrientes de funcionamiento	**154,123.70€**		
	c) Equipamiento e inversiones	**6,050.00€**		
TOTAL GASTOS: 240,573.04€			**TOTAL INGRESOS: 572,624.14€**	

IFIMAC

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