

ANNOUNCEMENT FOR THE AWARD OF RESEARCH FELLOWSHIPS

Title: Research Fellowship; 7 vacancy

Reference: 26/ECUM/CFUM/2026 - LaPMET

A call for applications is now open for the attribution of 7 (seven) research fellowships, under the Programme Contract concluded with the Portuguese Foundation for Science and Technology (FCT), effective from 1 January 2021, reference No. LA/P/0095/2020, within the framework of the award of Associate Laboratory status to the Laboratory of Physics for Emerging Materials and Technologies (LaPMET), of which the Centre of Physics of the University of Minho is a member through the FCT-funded research unit, the Centre of Physics of the Universities of Minho and Porto (CF-UM-UP), and the cooperation with the International Iberian Nanotechnology Laboratory (INL), under the following conditions:

Scientific Area: Physics, Physics Engineering, Materials Engineering

Recipient category:

The types of scholarship to be awarded are:

- a) **Degree courses:** Research grants (BI) are intended for I&D activities by bachelor's degree holders enrolled in an integrated master's degree or a master's degree.

Requirement for granting the fellowship:

- The applicants may apply without prior registration in the course for which the fellowship is open. The requirement to enroll in a degree course will be verified on the date of contracting the fellowship;
- Only fellowships whose selected applicants present a valid proof of enrollment in a degree course will be contracted, according to the type of the fellowship, issued by a Higher Education Institution, indicating, respectively, the academic year or its duration (start and term).

Applicants' eligibility: Candidates who meet the conditions set out in Article 9 of the Research Grant Regulations, No. 950/2019, of 16-12-2019, of FCT I.P. are eligible.

Nationals or citizens of other European Union member states, third-country nationals, stateless persons, and citizens with political refugee status are eligible to apply for this competition.

Candidate eligibility requirements:

- a) Bachelor's degree in Physics, Engineering Physics, or Materials Engineering;
- b) Preferred qualifications:
Preference will be given to candidates who demonstrate aptitude for scientific research, whether experimental, theoretical, or computational, depending on the project associated with the fellowship to which they are applying. Prior knowledge and participation in research activities relevant to the selected project's research topic and work plan, from among the projects listed below, will also be taken into consideration.

Workplans and objectives to be achieved:

Fellowship 1 – Optomechanical frequency combs towards quantum metrology applications: In the past decade the base system of SI units and measurements was successfully upgraded from a collection of physical artifacts to fundamental quantum units with exceptional precision (kg, m, A, etc.) Whilst some metrological techniques are very robust (quantum Hall effect, Josephson effect) it remains a challenge to produce controlled sources of electrons and phonons that are critical components for quantum devices. In this project we will explore single phononic sources based on silicon nanophotonic and nanophononic metastructures. The researcher will work alongside experienced researchers to experimentally characterise optomechanical frequency combs in the



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regimes of ‘self-pulsing’ and ‘phonon lasing’ in the MHz–GHz range. The aim is to characterise the device advantages and limits and to produce new insight for novel implementations in the time-regime and new architectures beyond the state-of-the-art.

Fellowship 2 – Rotating magnetocaloric effect and quantum magnetometry: this project explores magnetic anisotropy for rotating magnetocaloric effect. The aim is to optimize the magnetocrystalline anisotropy on magnetocaloric single crystal-based particles composites to maximize the rotating magnetocaloric effect at room temperature (RMCE). RMCE has the potential to be explored in refrigerant-gas free cooling technologies with enhanced energy efficiency. Quantum sensing based on a custom built widefield Optically Detected Magnetic Resonance (ODMR) and using a diamond with shallow Nitrogen Vacancy centers shall be used to characterize magnetic properties of these novel materials for the first time.

Fellowship 3 – Quantum algorithms for data clustering: Clustering algorithms are of fundamental importance when dealing with large unstructured datasets and discovering new patterns and correlations therein, with applications ranging from scientific research to medical imaging and marketing analysis. With the ever increasing amount of learning data, these algorithms face computational challenges that are only partially met by the development of special purpose classical computing units. This has motivated a recent interest in using quantum computing to machine learning tasks, in particular to clustering. In this project, we will explore quantum versions of density-based clustering algorithms. We will apply quantum computing primitives like quantum amplitude amplification and estimation to clustering subtasks such as nearest-higher search or density estimation. In the end, we hope to prove a quantum speedup for clustering problems, possibly conditioned on the structure of the datasets.

Fellowship 4 – AI and Machine Learning/Deep Learning Applications for Low Amplitude Transient Signal extraction: this project explores the use of AI, ML/DL techniques to explore several sources of signals with the objective of performing an efficient low amplitude signal extraction and characterisation. Following the current expertise within the research group, particular attention will be given to parameter estimation for modelled signal characterisation with a wide range of applications that goes from very low Gravitational Wave signals to Gravimetry.

Fellowship 5 – Investigation of the electro-optic properties in BaTiO₃-based materials by Density Functional Theory: Ferroelectric perovskites, such as BaTiO₃ (BTO), are promising materials for electro-optic modulators (EOMs) in photonic quantum computers owing to their large electro-optical coefficients and compatibility with nanoscale thin-film integration. In this project, we aim to use Density functional theory to calculate the linear optics coefficients of doped and undoped BTO. In addition, strain effects imposed by different substrates will be also evaluated theoretically.

Fellowship 6 – Quantum simulation with limited-depth quantum circuits: With the developments in practical implementations of quantum computers, and with fault-tolerant computation still apparently out of reach for the foreseeable future, much attention has focused on classical-quantum (hybrid) algorithms: those that can leverage a limited amount of quantum coherence while outperforming purely classical algorithms. This project aims at understanding the potential of noisy quantum computers with limited depth to solve problems related to the simulation of Hamiltonian evolution and measurement of observables on thermal states of many-body Hamiltonians, focusing on the trade-off between number of qubits, circuit depth and sampling overhead.

Fellowship 7 – Fabrication and Characterization of Hybrid Plasmonic Materials for Environmental Sensing Applications: The main objective of this project is the development of optical devices for environmental sensing with enhanced sensitivity and selectivity, based on novel hybrid nanomaterials. The hybrid materials will result from the combination of plasmonic materials, namely thin films containing plasmonic nanoparticles (NPs) of noble metals embedded in a dielectric matrix, with graphene or graphene quantum dots. These materials enable functionalization with recognition elements to achieve chemical selectivity toward the target analytes.

To accomplish the main objective, the following tasks are proposed:



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- Fabrication and deposition of graphene layers or graphene quantum dots onto plasmonic thin films;
- Advanced characterization of the fabricated nanomaterials using transmission electron microscopy (TEM) and electron energy-loss spectroscopy (EELS);
- Evaluation of the possibility of charge transfer between graphene and the plasmonic nanoparticles.

As indicated below, applicants must identify the research grant for which they are applying by referring to the numbering above. Each applicant may apply for only one of the research grants listed above. Applicants who submit more than one application will be excluded.

Applicable legislation and regulations: Research Fellow Statute (EBI), approved by Law n.º 40/2004 of August 18, in its current wording and FCT Research Fellowship Regulation, approved by Regulation n.º 950/2019, published in the Diário da República, 2nd series, of December 16, 2019, in its current wording, and Scientific Research Fellowship Regulation (RBIC) of the University of Minho, approved by order n.º 4998/2025, published in the Diário da República, 2nd series, n.º 81, of April 28, 2025 Amended and republished through amendment statement no. 634/2025/2, published in the Official Gazette, 2nd series, no. 132, of July 11.

Host/Contracting institution and scientific supervision: The work plans will be carried out at the facilities of the Centre of Physics of the Universities of Minho and Porto (CF-UM-UP), as well as at the International Iberian Nanotechnology Laboratory (INL), under the scientific supervision of:

(Fellowship 1) Dr. Thomas Yager (Postdoctoral Fellow at INL) and Prof. António José Abrantes Guedes da Fonseca Pereira (Auxiliar Professor at the Physics Department of the Schools of Sciences of University of Minho);

(Fellowship 2) Prof. Bernardo Gonçalves Almeida (Associate Professor with Aggregation at the Physics Department of the Schools of Sciences of University of Minho), Dr. Jana Nieder (Research Scientist Group Leader at INL) and Prof. João Horta Belo (Auxiliar Professor at Faculty of Sciences of University of Porto);

(Fellowship 3) Dr. Leonardo Novo (Research Scientist Group Leader at INL) and Dr. Duarte Magano (Invited Professor at Faculty of Sciences of University of Porto, Researcher at CF-UM-UP);

(Fellowship 4) Prof. Ricardo José Zambujal Ferreira (Auxiliar Professor at the Physics Department of the Schools of Sciences of University of Minho) and Prof. António de Aguiar e Pestana de Moraes (Auxiliar Professor at the Physics Department of the Schools of Sciences of University of Minho);

(Fellowship 5) Dr. Veniero Lenzi (Auxiliar Researcher Initial Level at the Department of Physics of School of Sciences of University of Minho, member of CF-UM-UP) and Prof. Luís Silvino Alves Marques (Auxiliar Professor at the Physics Department of the Schools of Sciences of University of Minho);

(Fellowship 6) Dr. Duarte Manuel Nogueira Magano (Invited Professor at the Faculty of Sciences of University of Porto, member of CF-UM-UP) and Prof. Joaquin Rossier (Research Scientist Group Leader at INL);

(Fellowship 7) Dr. Jérôme Borme (Research Scientist PI(Principal Investigator)) and Prof. Joel Nuno Pinto Borges (Auxiliar Professor at the Physics Department of the Schools of Sciences of University of Minho).

Fellowship duration: The grants will take place for a period of 4 months, with a provisional starting date on September 2026. The fellowship grants may, eventually, be renewed up to the maximum limit allowed by the project and/or applicable legislation.

Amount of the research grant: The amount of the grants corresponds to 1090.98€/month (Bachelor) according to the table of values of the Research scholarship of the University of Minho, updated annually, as decided by the Management Board.

Payment is made on the 23rd of each month, through bank transfer to the Bank Identification Number of the fellow identified in the contractualization process.



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Other benefits: Reimbursement of Voluntary Social Insurance, if the candidate chooses to receive it, corresponding to the 1st level of discounts (for research grants with a total duration 6 months or higher) and personal accident insurance.

Exclusivity regime: The grantee will perform the activities under exclusivity, as foreseen in article 5º of the Research Fellow Statutes and applicable regulations.

Selection panel:

António Joaquim Onofre de Abreu Ribeiro Gonçalves, Full Professor at the Physics Department of the School of Sciences of the University of Minho (President);

Mikhail Igorevich Vasilevskiy, Full Professor at the Physics Department of the School of Sciences of the University of Minho (member);

João Pedro Esteves de Araújo, Full Professor at the Department of Physics and Astronomy of the Faculty of Sciences of the University of Porto (member);

Christian Maibohm, Research Scientist PI (Principal Investigator) at the International Iberian Nanotechnology Laboratory (INL);

Rui Soares Barbosa, Research Scientist at the International Iberian Nanotechnology Laboratory (INL).

Criteria and procedures for applications assessment and selection: The applications assessment will focus on the candidate's Merit, following evaluation criteria, valued on a scale of 0 to 5 values:

Applicant Merit - AM (100%):

- a) Academic path (considering the classifications of academic degrees), with a weighting of 60%;
- b) Personal curriculum (considering professional and scientific background), with a weighting of 30%;
- c) Motivation letter, with a weighting of 10%.

The final classification of the applicant's merit with the achieved through the following formula:

$$AM=(a*0,6) +(b*0,3) +(c*0,1)$$

Application deadline and submission: The call for applications is open for a period of 10 working days from the date of publication on the Euraxess portal.

Applications must be submitted by email to onofre@fisica.uminho.pt, indicating the reference number of the competition in the subject line - **26/ECUM/CFUM/2026 - LaPMET**, and the fellowship number the application refers to (ex: *26/ECUM/CFUM/2026 – LaPMET; Fellowship 1*). Only applications submitted within the established deadline and accompanied by the following documents will be accepted:

- a) Candidate's updated curriculum vitae;
- b) Certificates of the academic degrees obtained or, if applicable, the candidate's declaration of honor that he/she has completed the degrees required in the notice by the application deadline (not applicable to research initiation grants).

For degrees obtained abroad, the record of recognition of the academic degrees and record of the conversion of the respective final classification to the Portuguese classification scale must be presented, or, alternatively, a declaration of honor from the candidate. This declaration must attest to facts that occurred prior to the application. In the event of a discrepancy between the information contained in the declaration and the documentation submitted for the purposes of contracting the scholarship, only the information contained in the latter will be considered. If it is found that the documents proving the academic degree and diploma, or their recognition under the terms of Decree-Law n.º 66/2018, of August 16, do not correspond to the classifications

- awarded in the assessment of the academic career and may consequently alter the candidate's ranking, the scholarship will not be contracted;
- c) Motivation letter.

Form of publication/notification of results: The results of the evaluation are published in a single list (in alphabetical order or by final score obtained), posted in a visible and public place in the host unit, as well as by email to all candidates, attaching, for this purpose, the minutes of the jury's deliberations, within a maximum period of 90 working days from the deadline for submission of applications.

Candidates are informed, at a preliminary hearing, in accordance with Articles 121 and 122 of the Administrative Procedure Code, of the likely outcome of the final decision, and may comment within 10 working days of this notification.

The waiver of the hearing for interested parties must be justified in accordance with Article 124 of the CPA

An appeal may be lodged against the final decision within 15 working days, or an appeal may be lodged with the highest executive body of the funding entity within 30 days, both after the respective notification (Article 12(nº6) of the FCT Research Grant Regulations).

Within 10 working days of notification of the grant award, the applicant must declare their acceptance in writing. In case of non-acceptance, the next highest ranked applicant will be notified immediately.

Fellowship contractualization: The scholarship is awarded through the signing of a contract between the University of Minho and the scholarship recipient, in accordance with point 2.4 of the Rules for the Award and Management of Scholarships

https://www.fct.pt/wpcontent/uploads/2022/03/Normas_de_Atribuicao_de_Bolsas_2021.pdf and the draft contract in Annex II of the University of Minho's Scientific Research Scholarship Regulations.

The contract can only be signed after receipt of all the documentation required for the type of scholarship, which must occur within a maximum period of 6 months, including proof of academic degrees or diplomas, as well as enrollment in non-degree study cycles or courses, as applicable.

Once all the documentation has been received, the contracting entity has 60 working days to sign the scholarship contract. Once received by the scholarship holder, the contract must be returned, duly signed, within 15 working days.

Term and cancellation of fellowship contracts: Without prejudice to the other grounds laid down in the University of Minho's Scientific Research Scholarship Regulation and in the Research Fellow Statute, the scholarship will cease on completion of the contracted work plan, as well as on expiry of the period for which it was granted or renewed.

The **final report** must be submitted to the scientific advisor, in accordance with the defined objectives and evaluation criteria, no later than 60 working days after the end of the scholarship and must be drawn up in accordance with Annex I of the Regulations of the University of Minho.

Non-discrimination and equal access policy: Universidade do Minho actively promotes a policy of non-discrimination and equal access, so that no candidate may be privileged, benefited, harmed or deprived of any right or exempt from any duty due, namely, to ancestry, age, sex, sexual orientation, marital status, family status, economic situation, education, social origin or condition, genetic heritage, reduced working capacity, disability, chronic illness, nationality, ethnic origin or race, territory of origin, language, religion, political or ideological convictions and trade union membership.



Declaration of Honor

Academic qualifications

I, (full name), candidate for the vacancy for the award of a (type of scholarship), within the scope of the project (name or reference of the project), published on the Euraxess portal, with the reference (ref. notice), declare on my honor that I have completed the academic degree of (academic degree), qualifying for the type of scholarship in the competition, namely the course (designation), by the (University conferring the degree), on the date XX/XX/XXXX, with a final average of XXXXX values on the YY scale.

As it is not possible for me to present proof of qualifications until the end of the competition, I declare that I undertake to present the aforementioned certificate at the conclusion of the scholarship contract, in the event that I am selected for the vacancy in the competition.

As this is true, I hereby date and sign this declaration.

(Place), (date).

(full name)

NOTE: The declaration may only attest to facts that occurred prior to the application.

In the event of a discrepancy between the information contained in the declaration and the documentation submitted for the purpose of contracting the scholarship, only the information contained in the latter will be taken into account.

Declaration of Honor

I, (full name), bearer of identification document number (XXXX), candidate for a research grant (type of grant), within the scope of the project (name or reference of the project), published on the Euraxess portal, with the reference (ref. call for proposals), declare on my honor that (I have not received any research grants to date / I have received the following research grants) under the Research Grant Holder Statute.

University	Financing Entity	Project	Type of Grant	Duration	Start	Term

As this is true, I hereby date and sign this declaration.

(Place), (date).

(full name)