



Università
Ca' Foscari
Venezia

Dipartimento di Scienze
Molecolari e Nanosistemi

Dipartimento di Scienze Molecolari e Nanosistemi
Università Ca' Foscari Venezia
Campus Scientifico – Via Torino 155, 30170 Mestre (VE)
P.IVA 00816350276 - CF 80007720271
www.unive.it/dsmn

Il Direttore di Dipartimento

Decreto del Direttore del Dipartimento di Scienze Molecolari e Nanosistemi 2022

1 Research fellowship - Università Ca' Foscari Venezia
(Italian law 30 December 2010, n.240, art. 22)

The present document in English is to be considered as a mere summary of the main provisions of the notice of competition which is available in Italian at the following ([link](#)) The text in Italian is the official text of the notice of competition for all legal intents and purposes and, in the event of non-conformity with the present document, it shall prevail.

Description

The Department of Molecular Sciences and Nanosystems at Università Ca' Foscari Venezia invites applications for a fellowship in:

Title: "Inertial magnetization dynamics studied with THz and XUV radiation"

SSD: FIS/03

Coordinator and Tutor: Prof. Stefano Bonetti

Duration: 24 months

Abstract:

The energy consumption of digital information is the fastest increasing item in the global energy balance, directly correlated with the ever-increasing data transfer from large-scale data centers, which rely magnetic technology for storing and writing information. The understanding of how spins, the building blocks of magnetism, move and can be manipulated at their fundamental ultrafast (pico- and femtosecond) timescales has implications for energy-efficient data-processing and storage applications in the data centers worldwide. However, the possibility of realizing novel commercial technologies based on such ultrafast spin dynamics has been hampered by our limited knowledge of the physics behind processes at these timescales. Recently, we detected for the first time the experimental evidence of intrinsic inertial effects in thin ferromagnetic films, in the form of a nutation of the magnetization at a frequency of ~ 0.5 THz, i.e. with a period of a few picoseconds. Right after our experiment, a first attempt of encoding information with picosecond electrical pulses has been made, which makes the understanding of magnetic inertia a fundamental and timely requirement for advancing this area of technology. This project suggests a cohesive approach to achieve an encompassing view of inertial spin dynamics in metallic ferromagnets, via three work packages. The first one aims at measuring inertial dynamics (i.e. spin nutation) driven by strong THz radiation in several magnetic materials using table-top femtosecond lasers and free electron laser radiation, and this opening aims at realizing this. Preliminary experiments on different epitaxial thin cobalt films show that different structural order and magnetic anisotropy affect the nutation frequency in a tangible way, laying the foundation for the research plan in this proposal. The proposed investigations are challenging and explore uncharted territories: we anticipate that they will advance the fundamental understanding of inertial spin dynamics and of ultrafast control of magnetization, with potential implications for future spin-based technologies.



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The project aims to investigate inertial spin dynamics in ferromagnets, recently discovered in the research group of the scientific coordinator of the project. Specifically, the research fellow will have to integrate an intense terahertz field system, to also be used at a beamline of the FERMI free electron laser at Elettra synchrotron Trieste. This will allow to study these dynamics with high spatial and temporal resolution.

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The research may be carried out in English.

The fellowship is intended to provide the successful candidate with the opportunity to pursue his/her own research while benefiting from the range of expertise at Università Ca' Foscari Venezia.

Who can apply

Prospective candidates are expected to hold a

-doctoral degree in Physics or related disciplines;

-scientific-professional curriculum suitable for carrying out research activities: experience with ultra-fast pulsed laser radiation, in particular in the visible, terahertz and XUV.

Ca' Foscari encourages applications from researchers with positive evaluation in all the criteria in individual proposals such as Marie Skłodowska Curie Actions - Individual Fellowships/ERC Starting Grants/FIRB (Italian Fund for basic research investments)/SIR (Scientific Young Independence Research) or similar.

Researchers having successfully completed Marie Skłodowska Curie Actions - Individual Fellowships/ERC Starting Grants/FIRB (Italian Fund for basic research investments)/SIR (Scientific Young Independence Research) or similar funded projects are warmly encouraged to apply.

The following qualifications are considered as evaluation criteria:

- a) **specialization diplomas and certificates of attendance of post-graduate specialization courses, obtained both in Italy and abroad, the performance of documented research activities in public and private entities with contracts, scholarships or assignments both in Italy and abroad 'abroad;**
- b) **At least one publication concerning the field of ultrafast magnetism dynamics studied with terahertz radiation;**
- c) **At least one publication concerning the field of ultrafast magnetism dynamics studied with XUV radiation.**

Duration of contract: 24 months approximately starting: **SEPTEMBER 2022.**

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Stipend: The research fellowship amounts to **29.821,84 Euros per year**, including taxes and social charges.

Deadline for submission of applications: 10/06/2022 at 12.00 (Italian time).

How to apply:

Candidates should submit:

1. The application form;
2. A motivation letter (max 1 page) along with their CV in European format, duly dated and signed, both to enclosed as a one single.pdf file. ([link](#))
3. A copy of a valid identity document (either Identity Card or Passport);
4. (If available) Evaluation Summary Reports of Marie Skłodowska Curie Actions - Individual Fellowships/ ERC Starting Grants/FIRB (Italian Fund for basic research investments)/SIR (Scientific Young Independence Research) individual proposals having passed all the evaluation thresholds;
5. (If available) Details of Marie Skłodowska Curie Actions - Individual Fellowships, ERC Starting Grants, FIRB (Italian Fund for basic research investments)/ SIR Scientific Young Independence Research funded projects;
6. All documents, qualifications and publications relevant for the selection procedure (please, see the notice [link](#)).

All the schemes of the quoted documentation are available on the website ([link](#)).

How to submit your application

Applications should be submitted by the online procedure, available on the notice webpage ([link](#))

Or submit here:

<https://apps.unive.it/domandeconcorso-en/accesso/dsmn-bonetti-prin-2022>

The candidate, after the uploading, will receive a submission number and an e-mail acknowledging receipt of his/her application.

The candidate if necessary could access the procedures for updating any data and materials **10/06/2022 at 12.00 Italian time.**

Please note that the University can be contacted for any support needs by the candidate until 24 hours prior to the deadline.

Please note that in case of an high number of applications and / or weight of the materials loaded by the candidates the system might become slower, Therefore it is suggested not to start the process close to the



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deadline.

NB: the University does not take on responsibility for wrong or late communication of addresses, nor for any communication problem not depending on the University.

Evaluation

Up to 100 points, specifically:

For qualifications, publications and possible tests, from 0 to 60;

For interview, from 0 to 40.

Selection procedure

The interview will be on June 22th 2022 at 14.00 p.m. (italian time)

Studio n.613 Sesto piano

Edificio Alfa

Via Torino n.155

30174 Mestre-Venezia

The list of candidates admitted to the interview will be published on June 16 2022 on the University web page ([link](#)).

The interview can be held via video conference subject to a duly justified request submitted by the candidate.

Topics of the interview:

- **solid state physics, in particular dynamics and out of balance states;**
- **ultrafast laser radiation, terahertz and visible;**
- **free electron laser generated XUV radiation.**

Information and contacts

Candidates may find further details about the application process and the research project in the official call published on the following ([link](#)).

For further information please contact DSMN - Research Sector, tel.041-2348699/8633 email: ricerca.dsmn@unive.it

Venice, 12/05/2022



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Scienze Molecolari e Nanosistemi
Prof. Maurizio Selva

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VISTO

La responsabile del procedimento

La Segretaria del Dipartimento di Scienze Molecolari e Nanosistemi

Sonia Barizza: barizza@unive.it

Telefono: 041-2348535 fax 041-2348517
