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**One Doctoral Candidate (DC) /PhD vacancy is available at the University of Padova (Italy) for highly motivated DC as part of the new Horizon Europe, EU-funded, Marie Skłodowska-Curie Doctoral Networks “HOMTech - Optical fiber higher order mode technologies and their application within communication, sensing and bio imaging” project (GA # 101072409).**

#### **About the EU project HOMTech**

Optical fibres supporting propagation of light in so-called higher order modes (HOMs) have gained major research interest in the last few years. However, there are still quite a few obstacles to overcome before HOM fibres can be used for major commercial applications.

In the HOMTech doctoral network, seven leading European universities, within the field of HOM fibres and their applications, join forces with one research institution and three European industrial partners and two world leading industrial research labs in the USA and Japan with the aim to significantly progress the field of HOM fibres and their applications. Five European countries are represented. Ten doctoral candidates (DC) will work in the network. Apart from the research and training at the host beneficiary, each DCs will also have two research secondments (both at least 3 months long) at another beneficiary or an associated partner. For DCs from academic partners, at least one of the secondments will be to an industrial partner. Five training schools in five different countries will be organized for the DCs through a joint effort between all beneficiaries.

The research within HOMTech project will be based on solid interplay between theoretical and experimental research. On the one hand, accurate physical descriptions and mathematical models regarding optical characteristics in particular of intermodal coupling and intermodal nonlinear effects are to be developed. On the other hand, detailed characterization of optical properties supports the physical descriptions and the mathematical modelling.

The project consortium embraces excellent European institutions. The beneficiaries are: Technical University of Denmark (DK, project coordinator), Chalmers University of Technology (SE), University of L'Aquila (IT), Luna Innovations Germany GmbH (DE), University of Padova (IT), Max Planck Institute for Polymer Research (DE), Eindhoven University of Technology (NL), KTH Royal Institute of Technology (SE).

They are accompanied by the following associated partners:

Nokia Bell Labs (US), National Institute of Information and Communications Technology (JP), University of Amsterdam (NL), Research Institutes of Sweden (SE), OFS Fitel Denmark ApS (DK).

#### **University of Padova (Unipd) open doctoral candidate position description**

A single position for a doctoral candidate (DC) is open in Padova to join the HOMTech project. The Host Institution for this specific position is the **Department of Information Engineering - University of Padova (Italy)** (<https://www.dei.unipd.it/en/departament/about-dei>). The project offers an excellent research and training programme to expand on recent advancements within HOM technologies and translate them into solutions that will benefit our society.

The research topic of the PhD position is the following:

- **Project DC #6: Distributed characterization and sensing using HOM fibres**

*Objectives: The main objective of the PhD program is to develop novel and effective models and data analysis algorithms to characterize the local properties of SDM fibres by analysing the Rayleigh scattering of the fibre. This should be done having in mind both fibre distributed characterization and its application to distributed sensing. Concisely, the activity consists of the following main tasks: 1. Implementation of an accurate numerical system model to generate realistic synthetic distributed measurements. 2. Theoretical analysis of the intrinsic limits and bounds of distributed measurements. 3. Design and development of novel algorithms to determine specific properties of the fibre, such as intrinsic modal dispersion and bending-and twist-induced coupling. 4. Implementation of experimental testbeds. 5. Experimental verification and application of the developed distributed measurement techniques.*

*Expected Results: Exploring and exploiting use of HOM fibers to enhance performance of distributed sensors e.g. reflectometric measurements. Development of numerically-assisted methods, using tools such as data-driven discovery of partial differential equations and machine learning. To this aim, reliable synthetic data must be created and intrinsic bounds must be analysed. The techniques will be tested in controlled conditions and applied to various scenarios.*

*Planned secondments: OFS Fitel Denmark ApS (DK), KTH Royal Institute of Technology (SE).*

### **Offer description/Benefits**

Successful candidate from this selection will be offered:

- a full-time 36 months employment contract/PhD student position. DC will be primarily hosted by the University of Padova (Department of Information Engineering) with stays in partner institutions (secondments) for a duration of up to one third of the recruitment duration. The DC is expected to join the University of Padova no later than March 2023 (estimated);
- a comprehensive, interactive and international training programme covering innovative and state-of-the-art approaches to the field of higher order modes (HOMs);
- a series of research-specific, complementary and soft skills, that involve both the academic and industry sectors and are tailor-made to prepare young researchers for their future careers;
- receive local and network-wide training (not only within the scientific fields of their work, but also on a broader perspective, e.g., regarding the commercial exploitation of the results of their projects), and solve cross-disciplinary problems jointly with co-researchers having different backgrounds;
- a competitive salary in accordance with the MSCA regulations for DNs:

- the living and mobility allowances: these allowances cover the personnel costs for the employment of the DC with full social security coverage and the additional private mobility-related costs respectively. The gross amount of the living allowance is EUR 3,311.60 per month (amount already adjusted through the application of an Italian correction coefficient; it includes any taxation/compulsory deductions under Italian law) and the mobility allowance is EUR 600 per month.

The gross salary (not including current employer's social contributions and taking into account the Italian regulations in force) amounts to around EUR 3,170.00 per month and the **net salary is approximately EUR 2,800.00** per month.

- an additional gross family allowance of EUR 660 per month (that amount includes any compulsory deductions under Italian law) applicable if the recruited DC has or acquires family obligations during the action duration. In this context, "family" is defined as persons linked to the researcher by marriage, or a relationship with equivalent status to a marriage recognised by the legislation of the country/region where this relationship was formalised; or dependent children who are actually being maintained by the researcher.

The MSCA programme provides for a long-term leave allowance and a special needs allowance; both to be requested when the need arises (see [Horizon Europe Work Programme MSCA](#) from p.77 onwards for more information).

Furthermore, the successful candidate will be enrolled in a doctoral programme at the University of Padova leading to the award of a doctoral degree in Italy, participate actively to HOMTech's training/dissemination/valorization program and join excellent opportunities to enhance the career prospects.

At University of Padova the research/training of the successful candidate will be carried out within the Department of Information Engineering, under the guidance of Professor Luca Palmieri. Other supervisors will join during the secondment periods.

### **Skills/Qualifications/Eligibility requirements**

Applicants need to fully respect the following requirements to be considered in this selection:

- supported researcher must be **doctoral candidate**, i.e. not already in possession of a doctoral degree at the date of the recruitment. Researchers who have successfully defended their doctoral thesis but who have not yet formally been awarded the doctoral degree will not be considered eligible.
- recruited researcher can be of any nationality and must comply with the following **mobility rule**: not have resided or carried out her/his main activity (work, studies, etc.) in Italy for more than 12 months in the 36 months immediately before the recruitment date (compulsory national service, short stays, such as holidays, and time spent as part of a procedure for obtaining refugee status under the Geneva Convention are not taken into account).
- candidates must have an MSc degree (or equivalent) related to the scope of the positions (preferably MSc degree in Electronic Engineering or Telecommunication Engineering or similar). The academic qualification awarded abroad must entitle to embark on a doctorate.
- candidates should be proficient in written and spoken English. Successful candidates may need to provide an English test (e.g. IELTS, TOEFL, Cambridge English). They may be exempt if they are a national of a majority native-English speaking country, or have qualifications/degree that has been taught and assessed in English.

Ideal candidates should be ambitious and hard-working with high motivation for scientific work and strong will for self-development. It is expected of them ability to travel within the EU and worldwide.

Note:

At the time of applications, doctoral candidates are provisionally accepted. When starting the procedures of entry into Italy, the successful candidate will be required to provide evidence of her/his eligibility requirements.

The successful candidate with academic qualifications awarded in non-EU Countries will be requested to provide the Declaration of value issued by Italian diplomatic or consular authorities in order to submit the Italian residence permit request.

Additional information concerning MSCA-DN regulations can be found in the [Horizon Europe Work Programme MSCA](#) from p.77 onwards.

### **Application and selection process**

The selection and recruitment process of the doctoral candidate will be in accordance with the European Charter and Code of Conduct for the Recruitment of Researchers and according to national legislation and recruitment procedures with the University of Padova. The recruitment process will be open, transparent, impartial, equitable, and merit-based. There will be no discrimination based on ethnicity, gender, sexual orientation, religion or belief, political views, language, disability or age.

Selection will be based on the performance of the candidates in other works (e.g. thesis and advanced level courses), as well as through interviews. Besides good subject knowledge, emphasis will be on creative thinking, motivation, ability to cooperate and communicate, initiative to work independently and in teams and personal suitability for research training.

To apply for the position, doctoral candidates are invited to fill in the online form available on this link:

<https://forms.gle/krzce3PcMWESaqFL6>

Candidates will be requested to provide the following mandatory documents/data:

1. a motivational letter stating why the candidate is willing to participate in this research project, the relevant interests, own aspirations and expectations for the research project;
2. the [CV in Europass format](#) ;
3. copy of a valid ID (i.e. European identity card or Passport);
4. the list of BS and MS exams with grades achieved;
5. a copy of Bachelor's certificate;
6. a copy of Master's certificate;
7. the contacts of at least two senior scientists available to provide a recommendation letter.

All documentation must be provided in English, or accompanied by an English translation. Further documentation might be required as part of the selection process.

The selection will be carried out by a Commission formed from supervisors/senior scientists from the HOMTech Partnership.

The applications will be pre-selected according to the essential criteria of the DN project/advertised criteria and subsequent short-listing of the candidates will be interviewed via a teleconference (TC) system. Applicants shortlisted for TC interviews will be notified by email.

The successful candidate will have to send a formal email notifying acceptance or rejection.

#### **Contact for information**

Candidates who would like more information/details can contact the following email addresses, taking care to write this text **"HOMTech project: request information"** in the subject line:

- [ricerca@dei.unipd.it](mailto:ricerca@dei.unipd.it) (regarding administrative issues)
- [luca.palmieri@unipd.it](mailto:luca.palmieri@unipd.it) (regarding details of the research position).

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