

PhD student in photonic integrated circuits research

Position Description

This job description is for a **joint PhD position** offered by the Brussels Photonics (B-PHOT) group at Vrije Universiteit Brussel (VUB, Belgium, <https://www.b-phot.org/>) and the Physics Institute of Cantabria at the University of Cantabria (UC, Spain, <https://ifca.unican.es/en-us/research/dynamics-and-fluctuations-in-nonlinear-systems>).

With 40 researchers from more than 15 different countries, B-PHOT at VUB is a renowned research group that has been active in the field of photonics for more than 35 years. Over the past decade, the group also acquired expertise on photonic integrated circuits (PICs) made of e.g. Indium Phosphide (InP). After designing the PICs, the fabrication is outsourced to so-called photonic foundries, and finally the PICs are tested in B-PHOT's state-of-the-art lab facilities. Several important proof-of-concept demonstrations have been realized over the years. For example, B-PHOT's nonlinear photonics team led by ERC Grant Holder prof. Nathalie Vermeulen showed that laser pulses propagating in PICs can experience exponentially growing spectral broadening when the PICs are covered with the two-dimensional material of graphene [N. Vermeulen et al., Nat. Comm. 9, 2675 (2018)].

B-PHOT also closely collaborates with prof. Ana Quirce from the Physics Institute of Cantabria at UC in Spain. The institute is specialized in the modelling and experimental characterization of the nonlinear behavior of semiconductor lasers, such as Vertical Cavity Surface-Emitting Lasers and Discrete Mode Lasers, when they are subject to external perturbations. In recent years, the group has established a research line on the generation of optical pulses using Gain-Switched Semiconductor Lasers to generate Optical Frequency Combs (OFCs) [A. Quirce et al., IEEE J. Sel. Topics Quant. Elec. 25, 1500109 (2018)] with applications in spectroscopy, optical communications and LIDAR. In her previous position at B-PHOT, prof. Quirce initiated her new research interest in PICs, researching the generation of OFCs using the InP PIC platform. She currently is in the process of translating this expertise to establish a new PICs research group at the Physics Institute of Cantabria.

This joint PhD position at VUB and UC (duration: 4 years) will be focused on research with pulsed lasers integrated on InP PICs. When using modelocking as the pulsing mechanism, very short pulses of a few picoseconds can be generated in these on-chip lasers, with application possibilities in datacom, sensing and many other fields. At VUB B-PHOT, modelocking was successfully obtained over the past year. Whereas on-chip modelocked laser development is a very promising field, there is still much to be explored in this research area in order to fully exploit the potential of these lasers.

The main goal of the PhD researcher will be to model and design InP PICs with on-chip modelocked lasers, and to perform experiments with the fabricated PICs in collaboration with the teams of prof. Vermeulen at VUB and prof. Quirce at UC. The PhD candidate will spend most of his/her time at VUB, the main host institution, to carry out experiments with the PICs, and will also travel a few times per year to UC for modelling and design work. Through this theoretical and experimental research at 2 different labs located in Belgium and Spain, the PhD candidate will acquire international research experience and obtain new insights in on-chip lasers and PICs in general. In view of the novelty of this research field, there will be plenty of opportunity for the PhD researcher to build up a strong research track record with high-impact publications.

Profile

- Required degree: Master in Physics or Master in Engineering.
- You have good knowledge of optics and photonics, and you know the basic concepts of lasers and optical waveguides.
- You have practical experience with experimental optical setups.
- Programming experience, e.g. with Matlab, is a plus.
- You are very motivated to pursue a PhD in photonics and you are good at working independently while also enjoying collaboration with others.
- You are well organized and are used to planning your work to reach your goals in due time.
- You have good verbal and written communication skills in English. If needed, you can take evening classes in English language during your PhD term to improve your language skills.
- You are willing to travel between VUB in Belgium and UC in Spain a few times per year, and to attend international conferences for presenting your research results.

Candidates who have not yet acquired their Master's degree can apply and participate in the selection procedure, but need to offer proof of registration in their Master's programme and need to have complied with all diploma requirements before starting the PhD position.

Offer

We offer a **4-year PhD contract with an attractive salary on a pay scale laid down by Belgian university rules**. This contract also includes **hospitalization insurance** and **reimbursement of transportation costs** to work. **The preferred starting date is the 1st of October 1st, 2021.**

At VUB and UC, we provide a friendly, dynamic and international work place. At the main host institution VUB, you will be working in B-PHOT's top-level lab facilities and brand new offices at the VUB Photonics Campus (<https://www.b-phot.org/news/pic-video>). The campus is situated in Gooik (Brussels area), Belgium, and can be reached by train in combination with a dedicated shuttle service. The Physics Institute of Cantabria is situated in Santander, Spain, which is within walking distance from the city center (<https://ifca.unican.es/en-us/about-ifca/how-to-arrive>).

Interested?

Interested in this PhD position? Please submit your detailed CV (including a copy of the Master diploma and a Transcript of Records), 2 recommendation letters and a concise motivation letter before the **1st of August 2021** to prof. Nathalie Vermeulen (Nathalie.Vermeulen@vub.be) and prof. Ana Quirce (quirce@ifca.unican.es).

The selection process will take place in two steps: first, the file of each applicant will be reviewed. Besides the criteria enlisted above, applications will be evaluated based on their overall quality.

Secondly, selected candidates will be invited to a (teleconference) interview and then it will be decided to whom the position will be offered.



360° picture of B-PHOT's demonstration lab for photonic integrated circuits