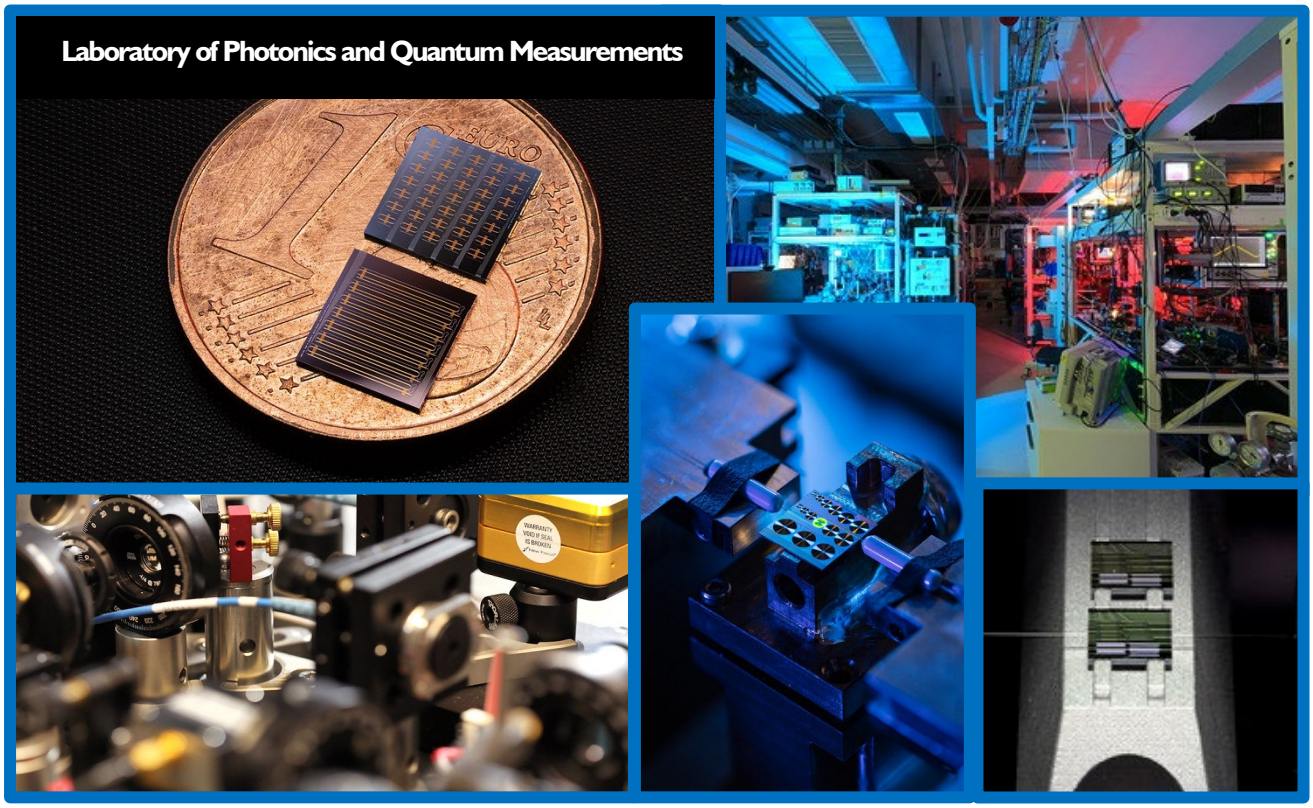

Two PhD positions in Photonic Integrated Technologies at EPFL

The Laboratory of Photonics and Quantum Measurements (LPQM) is developing next generation integrated photonics circuits for future energy-efficient communications, which can be used in datacenters or for AI accelerators, as well as for sensing, metrology and LiDAR. The laboratory models, designs and manufactures photonic integrated circuits using world-class microfabrication tools, and performs testing and advanced optoelectronic measurements using state-of-the-art instrumentation. The laboratory is also involved in fundamental research into the Physics of light in such photonic integrated circuits, with the aim of enhancing the non-linear interactions of light.

Within the framework of the Horizon Europe Marie Skłodowska-Curie European Doctoral Network "**MicroCombSys**: Photonic-System Engineering with Microcombs", **two PhD positions** are available within the research group of Prof. Tobias J. Kippenberg (http://k-lab.epfl.ch) to work on next generation microcomb technologies, with a view of advancing their capabilities towards technological applications on the one hand, and the understanding of novel fundamental nonlinear dynamics on the other.

The first topic concerns advancing optical microcombs (i.e., chip-scale frequency combs) towards their technological deployment. Optical combs are a Nobel Prize-winning invention that currently still requires complex and bulky photonic components. Advances in nonlinear photonic integrated circuits allow the creation of chip-scale frequency combs that can dramatically reduce size and weight, paving the way to novel applications in many fields: from astrophysical spectrometer calibration for exoplanets detection, to petabytes-per-second optical data communications. This project will advance the state of the art by incorporating novel materials – such as Erbium for implication – and by exploring novel concepts such as electro-optic combs in Lithium Niobate or Tantalate, for phase coherent microwave to optical

links, which can form the basis of future chip-scale optical atomic clocks. Similarly, these structures can be used for next generation of multiple-laser LiDAR sensors.

The second topic concerns exploring novel states of light that exist in driven dissipative nonlinear resonators. While many processes in nature exhibit emergent phenomena, it has not been possible to study them in well-controlled optical systems has not yet been possible. Microresonators offer the opportunity to study states and processes that give rise to optical patterning and are ubiquitous in nature, ranging from hydrodynamics to biology to chemistry. The study entails numerical simulation of nonlinear processes in complex integrated photonic structures, with the aim of understanding emergent nonlinear phenomena in laser-driven photonic chip-based microresonators.

The topics combine theory and experiment, numerical simulation and design and, if of interest, training in the microfabrication of photonic integrated circuit-based microresonators.

The projects will be carried out in the research group of Prof. Tobias J. Kippenberg (http://k-lab.epfl.ch), who will serve as Ph.D. supervisor. As this project resides at the interface of modern photonic integrated circuits fabrication technologies and modern applications (FMCW LiDAR, optical communications), the applicant will acquire a diverse set of experimental techniques ranging from wafer-mask design, optical characterization and electronic-photonic integration.

We offer a unique PhD experience

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- Industry exposure
- International conferences and outreach activities

Requirements

- A master's degree in engineering or physics
- An outstanding academic record
- Good communication skills in both written and spoken English

Previous research experience in optics, numerical simulation of photonic or electronic circuits, or nanoscale fabrication would be beneficial.

As per the Marie Curie eligibility rules, the candidate must not have resided nor carried out his/her main activity (work, studies, etc.) in Switzerland for more than 12 months during the last three years.

Diversity

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