
Open PhD position in Integrated Nonlinear Optics:

Developing a Scalable Silicon Carbide Platform for 2nd and 3rd order nonlinear processes

The Photonic Systems Laboratory (PHOSL) at the Ecole Polytechnique Fédérale de Lausanne is seeking two highly motivated PhD candidates to work in the field of nonlinear integrated photonics: to **develop the CMOS fabrication compatible and sustainable SiC platform and demonstrate efficient and versatile key nonlinear functionalities**. We offer excellent working conditions and state-of-the-art infrastructures in a dynamic and international environment at the forefront of research. Lausanne is a vibrant city and offers an excellent quality of life.

PhD positions are for four years, provided the selected applicant is successful at the candidacy exam taking place at the year of the 1st year. The salary is very competitive and follows the EPFL salary scale.

Responsibilities and tasks: The PhD topics are on the development of nonlinear integrated devices in silicon carbide. By combining numerical simulations, optimization methods, material properties and experimental demonstrations, the research aims to:

- Demonstrate key 2nd ($\chi^{(2)}$) order nonlinear effect in SiC waveguides and electro-optic modulation
- Demonstrate combined $\chi^{(2)}/\chi^{(3)}$ supercontinuum generation for frequency comb stabilization
- To exploit both crystalline 4H-SiC and amorphous SiC

Tremendous work has been done in the last decade to bring efficient 2nd ($\chi^{(2)}$) and 3rd order nonlinear processes on chip. While material with strong $\chi^{(2)}$ have shown great promise, they still face many challenges in terms of fabrication or reliability and remain CMOS incompatible. To overcome these limitations, we will develop wide bandgap third-generation semiconductor silicon carbide SiC. The PhD projects will focus on developing advanced designs and techniques to exploit and enhance nonlinearities, building on the expertise of PHOSL.

Framework: These PhD positions offer opportunities to contribute to cutting edge research and develop a highly promising photonic platform with significant potential impact on advanced photonics technologies for quantum, space or data centers. The project is a collaboration between PHOSL, C2N in Paris and CEA-Leti in Grenoble within the framework of a LEAD (SNSF-ANR) project, The students will be able to create links and exchange with the other engage entities of the project.

Qualifications: The candidates should have a master's degree (or equivalent), knowledge in photonics and inclined to experimental work ranging from nanofabrication to optical characterization. Previous experience in lab work, cleanroom activities and modeling/simulation of photonic devices (Comsol, Lumerical) is desirable but not necessary. The candidate will be able to work independently in a collaborative environment

Starting date and application: between February 1st 2025 and April 1st 2025. The search will continue until the positions are filled. Note also that prospective PhD students will also have to apply (and be accepted) to one of doctoral programs at EPFL (EDPO Photonics, EDEE Electrical Engineering, or EDMI (Microtechnique)). You can find more information at <http://phd.epfl.ch>.)

Candidates are invited to send (pdf format) a CV including a brief description of research experience, statement of research interest and contact information for at least 2 references by e-mail:

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