

PhD position on photonic circuits for the efficient extraction of single photons in wide bandgap semiconductors at the Institute of Physics of Ecole Polytechnique Fédérale de Lausanne

The laboratory of advanced semiconductors for photonics and electronics (LASPE) at EPFL, Switzerland, is actively looking for a motivated PhD student to **work on the design, fabrication and optical characterization of photonic elements and photonic circuits intended for maximizing the extraction of single photons issued from single photons emitters (SPEs) operating up to room temperature that are embedded in bulk wide bandgap III-nitride semiconductors** in the framework of a project funded by the Swiss national science foundation (SNSF).

The LASPE has initiated a research activity on the optical characterization of SPEs related to point defects (akin to NV centers in the diamond platform) embedded in GaN and AlN epilayers. Such SPEs that operate up to room temperature and that are potential candidates for quantum key distribution protocols span a wide range of emission wavelengths, from the visible-NIR (down to ~600 nm) to the telecom O-band. Leveraging the existing know-how, your role would consist in teaming up with the present researchers for designing, fabricating and characterizing photonic circuits intended for increasing the brightness of the current SPEs. By customizing/tailoring the photonic environment through advanced nanofabrication techniques (e.g., e-beam lithography) available at EPFL world class cleanroom facilities ([CMi](#)), you will demonstrate enhanced photon extraction. The realization of small mode volume high quality factor cavities is also envisioned to enhance the spontaneous emission rate of those SPEs by relying on the Purcell effect. You will also have access to state-of-the-art micro-photoluminescence benches for the in-depth optical characterization of the fabricated photonic circuits in close collaboration with the existing team. Finite-difference time-domain simulations will also be performed for optimizing the design of the structures.

Requirements: The candidates should have an excellent knowledge of semiconductor physics and photonics and been inclined to experimental work ranging from nanofabrication to optical characterization. Preliminary experience with cleanroom activities, micro-photoluminescence (incl. at cryogenic temperatures) and/or simulation of photonic devices (COMSOL, Lumerical) would be a desired asset.

Starting date: between January 1st 2025 and March 1st 2025.

The search will continue until the position is filled. The hiring of the candidate is subject to admission to the doctoral program in physics or photonics at EPFL. PhD positions last for a duration of four years, provided the selected applicant is successful at the candidacy exam taking place one year after his/her start. The salary will follow the EPFL salary scale for PhD students (same across the institution), which is known to be very competitive at the international level.

Candidates should address (in PDF format) their curriculum vitae, a motivation letter explaining their scientific interest, their official academic transcript, and at least two reference letters from past lecturers/scientific advisers to:

Prof. Nicolas Grandjean, full professor at LASPE, SB-IPHYS-LASPE, Station 3, EPFL, CH-1015, Lausanne, nicolas.grandjean@epfl.ch

Dr. Raphaël Butté, senior scientist at LASPE, SB-IPHYS-LASPE, Station 6, EPFL, CH-1015, Lausanne, raphael.butte@epfl.ch