

Post-doctoral/Engineer position on GaP-based non-linear integrated photonics for THz-wave generation

The FOTON institute is offering a 18-month post-doctoral/engineer position in the area of non-linear integrated photonics design and fabrication.

Starting date: available from September 2024

Supervisor: Alexandre Beck

Research team: Optoelectronics, Heteroepitaxy and Materials (OHM), at INSA-Rennes

Keywords: integrated photonics, nonlinear optics, numerical simulation, semiconductor processing

Project description

Terahertz (THz) covers the electromagnetic spectrum between infrared and microwaves. In this spectral range, roto-vibration molecular motions and collective resonances in solids have their characteristic energies. Owing to its capacity for unique bio-chemical specificity, THz radiation holds strong promise for a wide range of applications in material analysis, environmental sensing, and health diagnostics. At the same time, THz is beginning to impact high bandwidth free space communication since atmospheric windows fall in this spectrum and scattering by fog and pollution is reduced at long wavelengths.

New horizons are expected to be opened in these fields when moving from classical to quantum sources of radiation. THz applications rely on detectors with poor performances, intrinsically limited by the fact that the energy of the photon to be measured is comparable to the one of the thermal environmental background. Quantum mechanics provides a powerful tool to overcome these limitations: the entanglement.

The INTERQUO project deals with the realization of integrated THz quantum sources and their demonstration as sources in quantum imaging and spectroscopy experiments.

In the framework of this project, the main **objective** of the FOTON institute is the demonstration of **bright and miniaturized THz quantum sources based on Gallium Phosphide (GaP)**, operating at room temperature.

Such THz quantum sources will be demonstrated by using spontaneous parametric down conversion (SPDC) from infrared photons in integrated infrared and THz waveguide made in GaP.

Responsibilities and duties:

The person to be hired will take care of the design and the supervision of fabrication of the THz sources.

First, the work will consist of conception of waveguides in which SPDC will occur. These waveguides must guide both infrared and THz radiation. They also require dispersion engineering to maximize conversion efficiency with regards to phase-matching and infrared and THz modes overlap. Numerical and semi-analytic simulations will be used to determine the best geometries for sources at 3 THz and 30 THz.

Then, she/he will be responsible for the supervision of the fabrication process of the designed sources. Most of the fabrication steps will be made in collaboration at the C2N (e-beam lithography, GaP etching,..) and she/he will interact regularly with partners from C2N. Some specific technological steps (dielectric deposition, bonding,...) may also be developed in the FOTON institute by the fellow if required .

Qualifications

The candidate is expected to hold a Master degree and/or a PhD in photonics or optics. She/He should have a strong background in the field of nonlinear optics and photonic design. An experience in numerical simulation, semiconductor processing and photonic design and fabrication in cleanroom environment is an asset for the position.

This position is available from September 2024 for at least 18 months with a salary depending on qualification.

Partnership

About the Institut FOTON (CNRS, UMR6082)

The Institut FOTON is a research unit of the French National Centre for Scientific Research (CNRS) associated to University of Rennes 1 and the National Institute for Applied Sciences (INSA) of Rennes. FOTON is composed of three research teams: the “Optoelectronics, Heteroepitaxy and Materials” team, the “laser Dynamics, microwave photonics, Polarimetry, terahertz, imaging” team located in Rennes, and the “Photonic Systems” team located in Lannion. The two cities are located approximatively 170 km apart, in the province of Brittany, Western France. The OHM research team studies the elaboration, and the electro-optical/electronic properties of new materials, compounds, and devices (mainly semiconductors) for photonics and photovoltaics.

The successful candidate will carry out research in Rennes.

More information about FOTON can be found at: institute-foton.eu .

Further information-Contact

Further information may be obtained from Dr Alexandre Beck by email:

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Application procedure

Please submit your application at your earliest convenience by e-mail to:

job-ref-d447f9klot@emploi.beetween.com

Your application should include:

- Cover letter
- Detailed resume or curriculum vitae
- Copy of highest degree (Master or PhD)
- List of publications if applicable
- Recommendation letter or contact details of two references.

All qualified candidates are invited to apply.