Position: Postdoctoral position **Title: “Pump probe” spectroscopy of semiconductor nanostructures**

Catégorie :

BAP :

Position assignment and location : Clermont-Ferrand – Université Clermont Auvergne

Position to be filled: Post-Doc

Contract duration: 18 months

***The auditions will take place, for the selected candidates, on XXXX***

**MISSIONS AND WORK ENVIRONMENT:**

 **The Optical Spectroscopy of Solids (OSS) group** (Institut Pascal UMR 6602 UCA/CNRS - Clermont-Ferrand) has developed an internationally recognized expertise in the field of optical spectroscopy of semiconductor nanostructures and more particularly in the field of exciton-polaritons in microcavities or waveguides which are at the basis for the optical components of the future. This research team masters the analysis of optical properties of nanostructures at the femtosecond scale and aims to develop time-resolved nonlinear optical studies under high excitation. Actually, the optical spectroscopy experimental platform is based on various excitation laser sources (continuous, quasi-continuous (Q-switched type) and femtosecond). The actual femtosecond setup, associated with an ultra-fast detection system (streak camera with a resolution of one picosecond) enables to study the dynamics of optical transitions at the picosecond scale. However, the latter only delivers pulse energies of a few nano-joules, which strongly limits its use for nonlinear optics experiments.

 In order to increase the potential of the actual experimental platform and to access pulse energies greater than ten micro joules (in a wide range of wavelengths ranging from the visible to the ultraviolet), the team will acquire a new more powerful femtosecond setup consisting mainly of a power pump femtosecond laser associated with an optical parametric amplifier (OPA). The targeted temporal resolution of the “pump-probe” measurements that we propose to implement with this new equipment is only governed by the laser pulse duration and not by the bandwidth of the photodetectors or signal acquisition electronics. These pump-probe measurements therefore require a tunable laser source emitting pulses of around a hundred femtosecond duration at most.

This setup will allow to study the dynamics of quantum phenomena which occur on time scales less than a picosecond and which govern the operation of new optoelectronic components; applications could ultimately concern quantum cryptography and communication with levels of transmission security never before achieved.

**ESSENTIAL ACTIVITIES :**

The recruited candidate will perform the installation of the new experimental set-up to carry out nonlinear optical pump-probe experiments resolved in time at the femtosecond scale:

* Firstly, he will carry out preliminary study and technological monitoring work on “pump-probe” optical experiments under femtosecond excitation to determine the optimal architecture of the new set-up and its insertion in the actual experimental platform. He will also lead a reflexion about the choice and implementation of an optimal detection method for the measuring the differential reflectivity signal as function of time.
* He will be then in charge of **(i)** the reception of the new equipment, **(ii)** the installation of the femtosecond laser with its optical parametric amplifier for tunability in wavelength of the “pump” beam, **(iii)** the generation of the white light continuum up near ultraviolet (320nm) for the “probe” beam and **(iv)** the management of the detection system.
* He will then participate in the first “pump-probe” experiments on existing semiconductor nanostructures based on GaN and ZnO. The latters will enable to confirm and refine previous experimental results already obtained from quasi-continuous spectroscopy results and linked to the modification of the optical properties of these structures under strong excitation. A quick publication of the first results is expected.

**SKILLS REQUIRED :**

***Knowledges :***

* Experimental optics, nonlinear optics, pump probe spectroscopy, femtosecond spectroscopy. Solid state physics and semiconductor nanostructures physics

***Operational skills :***

* The candidate will have an experimental profile in the field of femtosecond optical spectroscopy with an initial experiment in pump- probe spectroscopy and/or non-linear optics.

***Behavioral skills :***

* The candidate should quickly integrate into the research team “Optical Spectroscopy of Solids” (OSS) which will allow him to benefit from the experience of this team in the field of spectroscopy of semiconductor nanostructures.

**PREREQUISITES / ACADEMIC FORMATION:**

PhD in Physics in the specialty « Milieux denses et matériaux » or « Milieux dilués et optique » (28th and 30th sections of the CNU respectively) preceded by a solid academic formation in Physics.

**POSITION SPECIFICITES / CONSTRAINTS :**

* Salary: 2300 euros per month
* Employment contract : 35 hours per week

**TO APPLY**

Please send a **CV and a cover letter no later than October 31, 2024** to the attention of *M. le Président de l’Université Clermont Auvergne* by email to **recrutement.drh@uca.fr**

**Contact for any information:**

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