Post: **Postdoctoral Researcher in Experimental Physics**
Location: Laboratoire de physique de l'ENS (LPENS), ENS, PSL, CNRS, Sorbonne Univ, Univ de Paris, France
Laboratoire de Physique des Lasers (LPL), CNRS-Univ Sorbonne Paris Nord, Villetaneuse, France
Team: QUAntum physics and Devices (LPENS), Metrology, Molecules & Fundamental Tests (LPL)
Contract: Fixed Term, 2 years, starting as soon as possible

High-sensitivity, high-resolution ultra-broadband heterodyne detection using high-speed room-temperature quantum well detectors

Job description:
The 2-year post-doctoral position is funded by the ANR project CORALI (*COherent mid-infrared RAdiometry and LIdar for atmospheric remote sensing*). The long-term goal of CORALI is to provide sensitive, accurate and compact mid-infrared detection systems for radiometry and LIDAR applications. These systems will be based on quantum cascade lasers (QCLs) and recently developed quantum well detectors operating at room temperature. This project is a collaboration between Laboratoire de physique de l'ENS (LPENS), Office National d'Etudes et Recherches Aérospatiales (ONERA), Laboratoire de Physique des Lasers (LPL) and THALES Research & Technology (TRT). The successful applicant will be associated to two Paris laboratories: LPENS (1st year) and LPL (2nd year).

During year 1, she/he will design and fabricate ultra-sensitive and ultra-fast (frequency response of a few tens of GHz) quantum detectors operating around 9 µm, based on a technology recently developed at LPENS. She/he will characterize and optimize the performance of these infrared detectors – responsivity, detectivity, frequency response,… – and will integrate them in LIDAR and radiometry heterodyne detection architectures.

During year 2, the post-doctoral researcher will thoroughly characterize and calibrate the heterodyne detection systems developed in year 1 using frequency metrology methods. The objective is to assess the fundamental performance of the detectors, and reach unprecedented sensitivities and spectral resolutions. This will in particular necessitate to use metrology-grade QCLs and set-up frequency metrology and ultra-high resolution spectroscopy demonstrators dedicated to precision tests of fundamental physics.

The successful applicant will strongly interact with both groups throughout the duration of the project.

Keywords:
Mid-infrared photonics, quantum devices, heterodyne detection, quantum physics, quantum optics, frequency metrology, atomic and molecular physics, LIDAR, heterodyne radiometry, precision measurements, optics and lasers, electronics, programming and simulation.

Publications from the teams:
LPENS: Bigioli *et al*, App Phys Lett **116**,161101 (2020), arXiv:2003.10752; Bigioli *et al*, Laser Photonics Rev **14**, 1900207 (2019); Palaferri *et al*, Nature 556, 85 (2018), arXiv:1709.01898
LPL: Santagata *et al*, Optica **6**, 411 (2019); Argence *et al*, Nature Photon. **9**, 456 (2015), arXiv:1412.2207; Sow *et al*, App Phys Lett **104**, 264101 (2014), arXiv:1404.1162

Requirements:
The applicant needs to have a PhD in one of the following area of experimental physics: photonics, optics and lasers, quantum devices, spectroscopy, quantum optics. An expertise in clean room nanofabrication is very welcome. She/he will be expected to display the initiative and creativity, together with the appropriate skills and knowledge, required to meet the project goals.

Interested applicants should email a CV, a brief description of research interests and the contact details of 2 referents to D. Gacemi (djamal.gacemi@phys.ens.fr) and B. Darquié (benoit.darquie@univ-paris13.fr).