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Postdoc position opening Summer 2021

High-frequency transport and optoelectronics in graphene vdW heterostructure based transistors

The advent of high-mobility graphene heterostructures opens new fields in 2D electron physics, electronics and optoelectronics. It is now possible to fabricate in the laboratory graphene field-effect transistors (FET) exhibiting remarkable transport properties under very large bias such as Zener-Klein-Tunneling, microwave amplification, or plasmonic effects. Among recent achievements of our group, let us mention the demonstration of 50GHz plasma-resonance capacitors and the Zener-Klein-Tunneling FETs with hyperbolic cooling. A remarkable new phenomenon arising in graphene/hexagonal-boron-nitride (hBN) heterostructures is near-field mediated heat exchange which play a prominent role in electronics and optics. In particular, the radiative pathways associated with hBN hyperbolic phonon polaritons (HPhPs). The project involves the exploration of this physics along its three entangled aspects: electronics, thermodynamics and optics.

To this end, the project consists in setting-up and exploiting a new experiment based on a variable temperature cryogenic microwave (DC-67GHz) probe station, modified to integrate high-resolution noise thermometry (1-10GHz), and optical excitation. These three characterization tools of electronic transport are individually mastered in the group; their combination will constitute a unique experimental platform.

Targeted experiments include: A) the demonstration of the 100GHz intrinsic limit of graphene-FETs, and its surpassing using sub-THz plasma-resonance transistors, B) the characterization of the hydrodynamic optoelectronic response, using dynamical transport under light irradiation (NIR and LWIR) C) the noise-thermometry diagnosis of the electron system under combined transport and optical drives.

Our Offer

The postdoctoral researcher will be appointed on a full-time position (18-month initial contract with possible extension) funded by the Graphene-Flagship Core-3 grant. She/He will be based at the Laboratoire de Physique de l'Ecole Normale Supérieure, in downtown Paris. LPENS offers a stimulating scientific environment with state-of-the art clean-room nanofabrication facilities. The research will be conducted under the supervision of E. Baudin and B. Plaçais, in the frame of the Core-3 EU graphene project. The hosting group has developed most of the experimental tools needed to address the optical and electrical measurements of the project. The postdoc salary is between € 2.728 and € 3.881 gross (€ 2.230 and € 3.169 net) per month depending on experience and qualification.

Your Profile

The candidate must have a Ph.D. and strong skills in condensed matter physics. The work will be essentially experimental and include sample fabrication, cryogenic electrical characterization. The candidate will have good experience in nano-fabrication techniques, including vdWs heterostructures. Specific knowledge in microwave, noise thermometry, or optical probing techniques are welcome but can be readily taught in-house. Experience in MatLab/Python, is strongly appreciated.

Information and Application

The CNRS is an equal opportunity and affirmative action employer and encourages women applications. To apply, please send us the following documents as PDF file (all documents in English):
(1) Letter of motivation including relevance for the post-doctoral project
(2) CV including full list of publications and communications
(3) Contact details of at least two referees (or letters of recommendation, if already available)