

Postdoctoral position Quantum Hall Effect for Metrology

Quantum Metrology Group - Laboratoire National de Métrologie et d'Essais (LNE)
Trappes – France

Framework/Funding: European Commission/IMERA+Project: ULQHE “Enabling ultimate metrological quantum Hall effect devices”

Duration: 13 months

Location: LNE Trappes (78) - France

Start date: September 2008 (or to be discussed)

The position proposed is in the context of the realization of Quantum Hall Effect (QHE) universality tests. These quantization tests of the Hall resistance in the integer QHE regime consist in high-accuracy comparison ($<10^{-10}$ in relative value) of quantized Hall resistances implemented in 2 dimensional electrons systems of different natures (Si-Mosfet, III-V and II-VI semiconductor heterostructures, and mainly graphene). The objective is to demonstrate the QHE universality with an uncertainty more than one order of magnitude smaller than the uncertainty of the previous tests, that is to say smaller than some parts in 10^{11} .

To achieve this ambitious objective, at LNE, we have developed an original technique, the so-called quantum Wheatstone bridge which has already given promising results (rel. uncertainty of 3×10^{-11} in the comparison of 4 GaAs/AlGaAs Hall bars). One important task of the hired postdoc will be also to contribute to the instrumental developments required to reach these goals (fitting of a ^3He fridge and a 18-20T superconducting magnet, fabrication of a cryogenic current comparator (CCC) equipped with a DC SQUID).

The results obtained concerning the QHE universality will be of crucial importance in the redefinition of the Système International of units (SI) based on fundamental physical constants. Those concerning graphene will have, moreover, a great impact on the whole Physics community.

The postdoc will benefit of the long experience of the group and its specific equipments and facilities for the implementation of the QHE for metrology (realization of primary electrical resistance standards and more fundamental issues requiring high resolution measurement of the effect...): labs with controlled environment (temperature regulated within 0.1°C , humidity within 5%, electromagnetic shielding, anti-vibrating installations...), ultra low noise instrumentation for high resolution electronic transport measurement, high magnetic fields (soon up to 20T), low temperatures ($T < 300\text{mK}$)...

The applicant will be PhD (or to be graduated) either in condensed matter physics (mesophysics and nanophysics for instance) with a great experience in the measurement and instrumentation or in instrumentation/metrology but with tastes for more fundamental issues.

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