Master 2: ***International Centre for Fundamental Physics***

INTERNSHIP PROPOSAL

(One page maximum)

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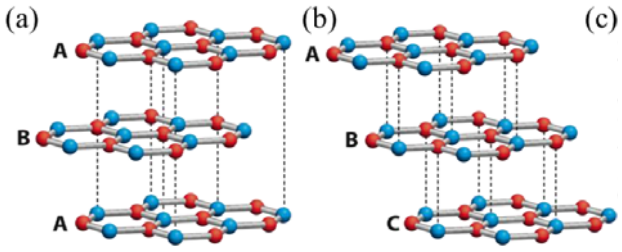
Internship location: 22-32/205

Thesis possibility after internship: YES
Funding: NO If YES, which type of funding:

Electronic Raman Spectroscopy of rhombohedral graphene

Attempts to induce a clean and stabilized gap in the excitation spectrum of graphene, or a robust magnetism preserving a high carrier mobility have not been successful yet. An alternative procedure to achieve an optical gap and a magnetic state in graphene is to explore correlated states in flat electronic bands hosted by multilayer graphene with rhombohedral stacking (see stacking ABC in figure (b) below) . Two interfacial states form at the top and the bottom surface of the N-multilayer. The ABC coupling make these states have a very low kinetic energy : a flat band with high effective mass. If we populate these states with electrons, we expect the Coulomb repulsion to strongly dominate over the kinetic motion of electrons leading to highly correlated oscillation modes of the charge or spin densities. Moreover, the low kinetic energy of such carriers could lead to gap opening even at weak Coulomb repulsion by stabilizing a magnetic or superconducting state.



Electronic Raman spectroscopy is particularly well suited to explore these new modes of oscillations of the electrons in such system.
Rhombohedral graphene appear as flakes of 10µm size. Our setup can probe the magneto-Raman signal over a few µmeters while transferring a momentum to the electrons with variable amplitude and direction. The project is fully experimental and fully exploratory as samples to be probed are very new. Samples are provided by C2N and LNCMI. The project is in collaboration with theoriticians at INSP and experimentators at LNCMI. It is well suited for a student aiming at learning and spending time on the experimental setup.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Macroscopic Physics and complexity: NO
Quantum Physics: YES Theoretical Physics: NO