

Sujet : PhD and Postdoc positions in Theoretical Condensed Matter Physics

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Pour : "meeticc.request.lps@universite-paris-saclay.fr" <meeticc.request.lps@universite-paris-saclay.fr>

Chers collègues du GDR MEETICC,
Pourriez-vous disséminer les informations ci-dessous ?
Merci beaucoup !
Aurélien Manchon

Dear colleagues,

The Theory and Numerical Simulation Department at the Interdisciplinary Center for Nanoscience of Marseille (CINaM, Marseille, France) has several open positions condensed matter physics theory, starting early Spring 2024. Applications should be sent to aurelien.manchon@univ-amu.fr and will be accepted until the positions are filled.

PhD Fellowship 1: Theory of laser-induced high-harmonic generation in topological materials

Using Floquet theory and/or time-dependent density functional theory, the candidate will explore the conditions for high-harmonic generation and investigate the signature of the material's topology on the harmonics. Joint supervision with Claudio Attacalite (CINaM) & Collaboration with experimental groups at CINaM and CEA, Saclay is expected.

Fellowship from the Institute of Excellence of Aix-Marseille University (AMidex).

- [1] High-harmonic generation from solids, Ghimire and Reis, Nature Physics 10, 15 (2019)
- [2] Nonlinear optics from an ab initio approach by means of the dynamical Berry phase, C. Attacalite and M. Grüning Phys. Rev. B 88, 235113 (2013)
- [3] Floquet formulation of the dynamical Berry-phase approach to nonlinear optics in extended systems, I. M Allati, and M. Grüning, Electron. Struct. 5 017001 (2023)

PhD Fellowship 2: Topological spin textures and excitations in van der Waals magnets

Using generalized Bloch theorem, the candidate will search for unconventional form of the antisymmetry Dzyaloshinskii-Moriya exchange interaction and the related emergence of topological spin textures in van der Waals magnets with low crystal symmetry. Joint supervision with Mairbek Chshiev (Spintec) & Collaboration with experimental group at LPS, Orsay, SPINTEC and Néel Institute, Grenoble.

Fellowship from the Agence Nationale de la Recherche (ANR).

- [1] Magnetism in two-dimensional van der Waals materials, Burch et al., Nature 563, 47 (2018)
- [2] Hund's rule-driven Dzyaloshinskii-Moriya interaction at 3d-5d interfaces, Belabbes, Bilhmayer, Bechstedt, Bluegel, Manchon, Physical Review Letters 117, 247202 (2016)
- [3] Elusive Dzyaloshinskii-Moriya interaction in monolayer Fe₃GeTe₂, Laref, Kim and Manchon, Phys. Rev. B 102, 060402(R) (2020)

Postdoctoral Fellowship 1: Spin-charge interconversion in ferroelectric Rashba gas

The candidate will develop theoretical and numerical study to model and investigate the spin-to-charge interconversion at interfaces between ferroelectric Rashba materials and ferromagnets, such as α -GeTe. Previous experience in density functional theory is appreciated but not mandatory. Collaboration with experimental group at CINaM and SPINTEC, Grenoble.

Fellowship from the Institute of Excellence of Aix-Marseille University (AMidex).

- [1] Non-volatile electric control of spin-charge conversion in a SrTiO₃ Rashba system, Noel et al., Nature 580, 483 (2020)
- [2] Ferroelectric Rashba semiconductors as a novel class of multifunctional materials, Picozzi, Frontiers in Physics (2014)

Postdoctoral Fellowship 2: Band structure engineering of graphene by supramolecular network

The objective of this project is the development of hybrid organic/inorganic a supramolecular network of zwitterionic molecules deposited on graphene. The candidate will simulate the networks of polar molecules on graphene and will investigate how these networks impact the band structure and anomalous transport properties. This work will involve both first principles calculations and quantum transport simulations. Collaboration with experimental groups at CINaM is expected.

Fellowship from the Agence Nationale de la Recherche (ANR)

- [1] Unconventional ferroelectricity in moiré heterostructures, Park et al. Nature Physics 4, 213–217 (2008).
- [2] See, e.g., First-principles studies of water adsorption on graphene: The role of the substrate, Wehling, et al Appl. Phys. Lett. 93, 1, (2008)

Thank you very much!

Aurélien

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