

L2IT-LPT scientific meeting

Thursday, January 26th, 2023

UMR UPS-CNRS 5152 – Laboratoire de Physique Théorique

Laboratory created in 2003, from the GPT-LPQ created in 1991

- ▶ Sections 02, 03, 04, 05 of CoNRS + 1 researcher in section 41
- ▶ Section 29 of CNU
- ▶ Hosting by UT3, management by CNRS



Presentation

The LPT in its environment

- ▶ One of the few theoretical physics laboratories in France
- ▶ One of the 6 laboratories of the **FeRMI federation** (fundamental physics and chemistry, created in 2020)



- ▶ Partner of the **EUR/Labex NanoX** (2019-2029)



- ▶ The LPT is member of the **Sciences de la Matière board** (SDM) with 16 research units in physics, chemistry, materials
- ▶ Opportunity: new IN2P3 laboratory since September 2019, the L2IT (29th section, CNU)
- ▶ A laboratory involved in many scientific fields, **in physics and at the interfaces of physics**, and using a wide range of analytical and numerical techniques

Research teams

FFC

Didier POILBLANC
(DRCE CNRS, section 03)

ALET F. - DR2 CNRS (Section 03)
CAPPONI S. - PRCE UPS
KURKJIAN H. - CRCN CNRS (Section 02)
LAFLORENCIE N. - DR2 CNRS (Section 02)
MAMBRINI M. - CRCN CNRS (Section 03)
PETKOVIC A. - MCF UPS
PUJOL P. - PR1 UPS
RAMAZASHVILI R. - CRCN CNRS (Section 03)
RISTIVOJEVIC Z. - CRCN CNRS (Section 03)
TRIFUNOVIC L. - CRCN CNRS (Section 03)

Post-docs : COLBOIS J., NIU S.

QUANTWARE

Dima SHEPELIANSKI
(DR1 CNRS, section 02)

FRAHM K. - PR1 UPS
GEORGEOT B. - DR1 CNRS (Section 02)
LEMARIE G. - CRCN CNRS (Section 02)
NECHITA I. - CRCN CNRS (Section 41)

Post-doc : HEBRAUD J.

PHYSTAT

Clément SIRE
(DR1 CNRS, section 02)

CHAVANIS P.-H. - DR2 CNRS (Section 02)
DESTAINVILLE N. - PRCE UPS
MANGHI M. - MCF HC UPS
PROLHAC S. - MCF UPS

Post-docs : ESCOBEDO MARTINEZ R.,
HENNEQUIN T.

AGREGATS

Éric SURAUD
(PRCE UPS, section 29)

BELKACEM M. - MCF UPS
ROMANIELLO P. - CRCN CNRS (Section 03)
SEVE-DINH M. - PR2 UPS

Post-docs : DI SABATINO S.,
VINCENDON M.

Some key words

- ▶ **Strongly correlated fermions (FFC)**

Quantum magnetism, unconventional superconductivity, low dimensional materials, quantum phase transitions, quantum information, cold atoms, **numerical simulations**...

- ▶ **Quantum Coherence (Quantware)**

Quantum computer, quantum algorithms, quantum information, role of disorder and impurities, classical and quantum chaos, mesoscopic physics, cold atoms, nonlinear physics, astrophysics, physics of social networks...

- ▶ **Statistical Physics of Complex Systems (PhyStat)**

Soft matter physics, biophysics, far-from-equilibrium systems, disordered systems, long range interacting systems, stochastic processes and their applications, **astrophysics**...

- ▶ **Finite Fermions Systems – Clusters (Agrégats)**

Laser-matter interaction, clusters in external fields, physics of clusters in an environment (surface, matrix, solvent...), clusters of biological interest, numerical simulations and methodology...

A range of specific tools...

- ▶ **Analytical tools, tools from condensed matter and soft matter, atomic physics, statistical physics, non-linear physics**
 - Classical and quantum field theory
 - Advanced statistical methods
 - Stochastic processes (classical and quantum) ; probability theory
 - Non-linear physics, classical and quantum chaos
 - Heuristic and phenomenological arguments!
- ▶ **Numerical methods**
 - **Quantum methods:** DFT, TD-DFT, quantum Monte Carlo, renormalization group and DMRG, exact diagonalization...
 - **Classical methods:** Monte Carlo, non-linear PDE, molecular dynamics, finite elements...
 - Resources: LPT cluster (CPU and GPU) – CALMIP – IDRIS – PRACE
- ▶ **Collaborations with experimental groups**
 - Magnetism and condensed matter
 - Transport in nanostructures and mesoscopic physics
 - Cold atoms
 - Biology, biophysics and soft matter
 - Collective behaviors (animals and humans), etc.



...favorable to interfaces with other disciplines

→ Very multidisciplinary activity