LPT - Laboratoire de physique théorique

Rapport Hcéres

agence d'évaluation de la recherche
et de l'enseignement supérieur

Research Units Department

AERES report on the unit:

Laboratoire de Physique Théorique (LPT) - UMR 5152

under the supervisory authority of the following institutions and bodies:

Université Paul Sabatier - Toulouse 3

CNRS

July 2010

agence d'évaluation de la recherche
et de l'enseignement supérieur

Section des Unités de recherche

Rapport de l'AERES sur l'unité :

Laboratoire de Physique Théorique (LPT) - UMR 5152

Sous tutelle des établissements et organismes

Université Paul Sabatier - Toulouse 3

CNRS

Le Président
de l'AERES

Jean-François Dhainaut

Section des unités
de recherche

Le Directeur

Pierre Glorieux

Juillet 2010

Unit

Name of the unit : Laboratoire de Physique Théorique

Requested label : UMR

No. in case of renewal : 5152

Unit director : Mr Clément SIRE

Members of the expert committee

Chairperson:

Mr Marc MÉZARD, CNRS, Université Paris 11

Reviewers:

Mr Oriol BOHIGAS, CNRS, Université Paris 11

Mr John CHALKER, Université d'Oxford

Mrs Lucia REINING, CNRS, Polytechnique

Reviewer(s) nominated by the staff evaluation committees :

Mr Pierre TAXIL, CNU

Mr Malte HENKEL, CoNRS

Representatives present during the visit

Scientific delegate representing AERES :

Mr Claude LECOMTE

Representatives of the institutions and bodies that supervise the unit:

Mr Patricio LEBOEUF, Directeur Scientifique Adjoint, Institut de Physique, CNRS

Mrs Sylvie ROQUES, membre de la Direction Stratégique de la Recherche et du Conseil Scientifique de l'Université Paul Sabatier

Report

1 • Introduction

- Date and conduct of the visit :

The visit took place on November 16, 2009. The schedule was the following :

- From 9am to 11am, the committee has listened to a general presentation of the LPT by the director, followed by presentations of each of the four research groups by the heads of the groups.
- It then had, until 12h45, discussions with the permanent members of the laboratory, the students and postdocs, representatives of the University and CNRS and the IRSAMC director.
- From 2pm to 3pm, the committee split into two groups which visited in parallel the groups working on strongly correlated fermions and on quantum chaos.
- From 3pm to 4pm, the committee split into two groups which visited in parallel the groups working on complex systems and on finite fermionic systems.
- From 4pm to 6pm, the committee met behind closed door, deliberated, and agreed on the main points to appear in the report.

The written documents provided to the committee were remarkably well written, and covered thoroughly all the relevant questions. The general presentation by the director and the following research reports were of excellent quality. The scientific discussions in the afternoon were very useful.

- History and geographical location of the unit and brief description of its field of study and activities :

The LPT grew out of a team of theoretical physicists which started in Toulouse in 1991. It became an UMR of CNRS and Université Paul Sabatier (UPS) in 2003. It is a rather young laboratory with extremely active researchers, and a very good research atmosphere. The LPT is located in the Université Paul Sabatier (Toulouse 3). It is one of the four laboratories belonging to the federation IRSAMC (FR 2568). The research staff consists of 9 CNRS researchers (3 DR and 6 CR) and 9 enseignants-chercheurs (6 Professors and 3 Maîtres de Conférences). The activity of the laboratory is in statistical and condensed matter physics. It is structured into four groups. The group `Strongly Correlated Fermions' (FFC) has 5 permanent researchers. It works on various aspects of strongly correlated quantum systems, from quantum magnetism to high temperature superconductivity. The group `Quantum Information and Chaos' (Quantware) has 5 permanent researchers. It works mainly on quantum and classical chaos, quantum computing and mesoscopic physics. The group `Statistical Physics of Complex Systems' (PhyStat) has 6 permanent researchers. It works mainly on disordered and out-of-equilibrium systems, on biophysics, and more generally on stochastic processes. The group `Finite Fermionic Systems' (Clusters) has 2 permanent researchers. It works on laser-matter interaction and the study of small clusters.

This laboratory is thus active in a broad variety of modern topics of statistical and condensed-matter physics. At the same time there is a strong unity. This is made possible by the rather small size of the laboratory. It is reflected by the existence of a unique weekly seminar common to all teams, by a unique and common governance body including all permanent members (see below), by many scientific collaborations between members of the lab. The committee has felt that this unity is an asset of the laboratory, and that, in these circumstances, it would be counterproductive to make a separate evaluation of each of the teams. The report will thus of course consider all aspects of the scientific activity, but give a global appreciation for the whole laboratory.

- Management Team :

The management by the director in the last four years has been very efficient and successful, this satisfaction is also expressed by the members of the laboratory. The administrative service is remarkably efficient.

This being a small laboratory, there is no scientific committee of the lab, the whole laboratory meets weekly with the director in order to discuss various issues, and in particular to discuss the scientific policy. In case of particularly important decisions, the meeting proceeds with all permanent members. All the members of the laboratory are happy with this governance mode, which gives to everyone an easy access to all information and a direct participation to the decision making process. There is thus no point in changing it.

- Staff: (according to the dossier submitted to AERES) :

	In the report	In the project
N1: Number of professors (see Form 2.1 of the unit's dossier)	9	9
N2: Number of EPSTor EPIC researchers (see Form 2.3 of the unit's dossier)	9	9
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	1	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	1.5	1.5
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	0	0
N6: Number of doctoral students (see Form 2.7 of the unit's dossier)	8	7
N7: Number of persons accredited to supervise research and similar	11	14

With one CNRS researcher leaving the laboratory, and another one who has just been hired, the composition of the laboratory is stable, with a rather uniform distribution of ages between 33 and 53.

2 • Assessment of the unit

- Overall opinion :

The committee has been very favourably impressed by the quality of the research carried out in this laboratory. Several of the senior researchers are very well-recognized at the international level. The laboratory as a whole is extremely productive, and all members are active in research, in an excellent atmosphere of scientific curiosity and collaboration. Some of the works done in recent years are of the highest quality at the international level, and some of the results obtained are landmarks. Beside its high-level activity in some of its 'traditional' fields of interest, the laboratory has greatly diversified its interest, most notably through the rapid development of the activity around biophysics, the evolution of the 'quantware' activity towards some topics at the frontiers of computer science, and the development of studies on cold atomic gases. Altogether, the scientific activity in this laboratory is of extremely high level, as is also attested by the success of the laboratory in various selective instances, ANR grants, IUF (3 members), Chaire Pierre de Fermat.

- Strengths and opportunities :

  - The activity in several fields, notably on strongly correlated quantum systems, on stochastic processes and disordered systems, on quantum information, is at the top French level and in some cases at the top international level.
  - The laboratory has found a good balance between its activity in its traditional fields of expertise and the introduction of new topics. The committee wants to mention particularly the evolution towards biophysics and soft condensed-matter, which has already obtained significant results and creates multidisciplinary collaborations with other teams on the campus.
  - The atmosphere in the laboratory, inside each group and between groups, seems to be very positive and constructive.
  - The laboratory has good connections locally with other laboratories in the Toulouse area, starting with its insertion in the IRSAMC federation, but also with other laboratories in mathematics or biology. It also has many international contacts.
  - The laboratory has been very successful in getting funding, in particular through 7 ANR grants. This has allowed to have a sizeable group of post-docs, which is excellent.
  - There is also a collective effort in teaching, and a real will of several CNRS researchers to teach. A large number of the members of the laboratory have made a collective effort to be present in the various scientific instances at the level of the CNRS, of the University and the various granting and evaluation agencies, ANR and CoNRS.
  - The scientific and administrative management is excellent.
  - In spite of its relatively small size and its relative isolation from the center of mass of French theoretical physics, it is doing extremely well.

- Weaknesses and threats :

There are no weak points at the moment : the laboratory is doing very well. The aim is to keep it going as well in the future. In this respect, some general issues that should be kept in mind are mentioned in the next section

- Recommendations :

  - This is a relatively young laboratory, where the next retirement will be in 12 years. As the laboratory naturally aims at keeping its flux of young researchers joining it, this means that the laboratory will probably grow in the next years. The potential issues risen by this growth, concerning office space, governance, administration, balance between topics, must be kept in mind.
  - The teaching loads of the enseignants-chercheurs (EC), and the teaching of the CNRS members, are two related issues which are very important. In recent years, three of the EC of the laboratory, who had obtained some possibility of `décharge d'enseignement' through an ANR grant, have not obtained this `décharge'. This is not acceptable. It is even less acceptable in view of the fact that several CNRS researchers do a sizeable teaching activity in the UPS `for free'. The UPS is invited to make some effort to i) accept the system of `décharge' and ii) accept the teaching of volunteer (and capable) CNRS researchers. In this second case it would seem natural that the EC of the laboratory should get a smaller teaching load. This evolution towards a kind of global teaching load for the laboratory, shared between EC and CNRS researchers under the responsibility of the EC, would be certainly a very welcome evolution. The committee is conscious of the fact that this issue is a major issue at the level of the University (and of the organisation of research in France), which goes well beyond the case of the LPT. It also wants to mention that the LPT could be a perfect laboratory for testing some pioneering move in this direction, because of its size and governance, because of the balance between CNRS and EC, because of the fact that several CNRS members are already teaching.

- In spite of its successful activities, the CLUSTERS group has clearly a problem of critical mass, which is enhanced by the teaching loads, and by the involvement of the group leader in numerous important administrative responsibilities over time. One problem is that the group is not clearly inserted into a community. This holds from a structural point of view : the research done in the group is probably closest to the subjects of the CoNRS section 05, whereas the laboratory has rather been closely attached to CoNRS section 02, which made it difficult to have successful candidates in a CNRS selection. Moreover, it holds from a purely scientific point of view: the group has a very strong collaboration with one group in Germany, but no other important link in a national or international community. This fact is certainly slowing down scientific dynamics, and also making the group less attractive for PhD students and young researchers. Actions should probably been taken on several levels. The most obvious point is to try to increase the group by hiring a CNRS researcher, to be presented in CoNRS section 05. This is indeed declared to be high priority by the laboratory. It may be very beneficial to search a candidate who is already relatively scientifically mature (maybe CR1 level) and therefore able to become truly responsible for one of the research lines, giving important impulsions. At the same time, the group should certainly try to make stronger links with existing communities. Especially in view of their interdisciplinary ambitions, this could help to boost the activities and, most importantly, to help PhD students and post docs to push their limits of knowledge and deepen their understanding.
- The committee also fully supports the second hiring plan, namely the recruitment of a young researcher in the QUANTWARE group, particularly since one of its active young researchers has recently left.
- It is important that researchers who can do it defend their habilitation (for CNRS researchers this has become in practice a nearly-necessary condition for the DR2 promotion). More generally, the laboratory must take care to favour the emergence of leaders in the younger generation.
- The financial situation of the laboratory is fine, but it relies a lot on the grants and its direct yearly funding from CNRS and UPS are not very high, compared to other laboratories. This may create some difficulty.
- The gender balance is bad, both at the level of permanent members but also for students and postdocs. This is a general fact of French theoretical physics. A global reflexion is needed about how to overcome this situation, and this laboratory should participate to this reflexion.
- The computer system is well managed and gives satisfaction. A crucial concern for this laboratory, in view of the importance of numerical simulations in its activity, is maintenance of up-to-date local computing facilities. The current computing cluster was purchased in 2007 with the help of a special grant. It would be prudent to plan soon for next upgrade to computing resources and to identify the funding mechanism for it.
- The structure of IRSAMC is innovative and seems to be running satisfactorily, in that it provides a unified structure to be an interlocutor towards the University. The laboratory has opposed to some suggestions of fusing the four laboratories of IRSAMC in a single structure, with good arguments. At the moment the present organisation into independent laboratories and a federation taking care of some common issues, both scientific (joint seminar) and vis-à-vis the University, seems to be doing fine. The committee recommends to stay with this structure.

- The LPT has only one secretary/administrator who manages the budget of the LPT and of the IRSAMC federation. This task is carried out very efficiently, but it clearly involves a heavy workload. In view of the number and variety of administrative tasks, and the large number of grants which must be managed, this is a somewhat risky situation. The insertion inside the IRSAMC is clearly a very positive aspect of the organisation of the federation which helps in a smooth running of the administrative tasks. But the committee wants to call the attention of the `tutelles' concerning the retirements of several administrators in the labs of IRSAMC in the next few years, and the potential instability associated with this situation.
- The new research orientations will offer opportunities to develop even stronger links between the groups, and with other laboratories on the campus. It is advisable to exploit these new opportunities.
- It would probably be a good idea to start again the students' seminar, which had existed but has stopped.

- Data on work produced for the report :

(see http://www.aeres-evaluation.fr/IMG/pdf/Criteres_Identification_Ensgts-Chercheurs.pdf)

A1: Number of *produisants* (professors and researchers whose names appear in a minimum number of "publications" over a 4-year period) listed in N1 and N2	18
A2: Number of *produisants* among the other staff listed in N3, N4 and N5	0
A3: Proportion of *produisants* in the unit [A1/(N1+N2)]	100%
Number of theses for accreditation to supervise research defended	2
Number of theses defended	8
Any other data relevant for the field (please specify)	

3 • Team-by-team and/or project-by-project

The `**strongly correlated fermions'** (FFC) group consists of 3 CNRS (1 DR and 2 CR) and 2 Professors. It has an expertise in numerical studies of strongly correlated quantum systems that is both very broad and at a very high level. Two recently appointed members of the group bring a complementary strength in analytic techniques.

The group has been extremely productive over the past four years, as is amply demonstrated by the quality and number of its publications. It has an outstanding international profile and is competitive with the best in its field world-wide. Not surprisingly, it has a large network of collaborations in Europe and the USA, especially with other theorists but also with experimentalists.

The problems the group has addressed over the past four years vary from studies of specific materials, linked closely with experimental observations, to investigations of simplified models, chosen to exemplify key theoretical ideas. This range is entirely appropriate for a group working in this field. One highlight is work on the behaviour of spin ladders as a function of temperature and magnetic field, giving results that have been tested extensively via specific heat and magnetocaloric measurements on $(C_5H_{12}N)_2CuBr_4$. A second highlight is the study of magnetisation plateaus for spin systems on the Sutherland-Shastry lattice, which has been related in considerable detail to experiments on $SrCu_2(BO_3)_2$. Some further notable results involve purely theoretical progress. One of these is the development of quantum Monte Carlo methods using a valence bond basis, and the application of these methods to study the phase transition between Néel order and a valence bond crystal in SU(N) Heisenberg models.

Another is the identification of novel phase transitions in classical dimer models.

The group's plans for the period up to 2014 naturally build on its current success, but also take account of promising new ideas in the field and changes in the local scientific landscape. Examples of worthwhile extensions to current work include planned studies of generalised quantum dimer models and investigations of charge inhomogeneities in cuprate superconductors. New directions include work on Fibonacci anyons and the development of diagrammatic quantum Monte Carlo techniques. Finally, the establishment of a cold atom experimental group at LCAR offers important fresh opportunities for collaboration.

The **`Information and quantum chaos'** (QUANTWARE) group is formally composed of six members, three professors and three CNRS members (1 DR1 and 2 CR). One of the professors is retiring and leaving now and one CR is leaving to Orsay for personal reasons. The group finds its roots in the Russian school working in the general area of classical and quantum chaos. This style, namely a subtle mixture of concrete thought of general interest problems, has been developed nicely in the LPT. The methods used go from analytic approaches, mostly approximate, to extensive numerical methods, always driven by the physical system under study.

The group includes several very good scientists and it has taken care to avoid a 'monochromatic' research. This group is now very attractive and well balanced, with several directions of research but with a sufficiently strong common background which facilitates interactions in the group. The activity is rich and has variety, going from mathematical physics to very 'concrete' problems (one of the members has several patents).

The center of gravity of the group has shifted with time. Starting from typical problems of chaotic dynamics (quantum suppression of chaos, localisation, etc), a great effort has been devoted to study contemporary problems of quantum information where the role of chaos may be important. This has given rise to original and significant results. Let us mention : development of new quantum algorithms, role of interference and decoherence, role of imperfections and errors, production of random states, etc. It constitutes a substantial body of results in a field which has known, in recent years, an impressive development worldwide, but which in France has been comparatively timid. The group of Toulouse is one of the few major exceptions. A good atmosphere of intellectual freedom is present. This allows to deal with subjects which don't belong strictly to the main stream. Let us mention some problems in mathematical physics in quantum chaos as well as some developments in planetary physics (Saturn rings) and astrophysics (rapidly rotating stars). A general evolution towards algorithmics and complex systems in general can be anticipated.

This group is very active and of first quality at an international level. The group benefits of three ANR contracts but would highly benefit of some kind of old « poste rose » system, which may be better adapted to a long plan strategy.

The group **`Physique statistique des systèmes complexes'** (PHYSTAT) consists of 1 professor, 2 Maitres de Conférences, and 3 CNRS researchers (1 DR and 2 CR). The research carried out by this group over the period 2005-2009 is of excellent scientific quality, world-leading in some of its aspects, innovative in the choice of its topics and with a strong international impact and visibility. The main following themes are treated :

Biophysics and soft condensed matter. The LPT has made a conscious sustained effort to develop this very timely topic at the interface between physics and biology. In view of the intrinsic complexity and strong fluctuation/correlation effects, a deeper fundamental understanding through the application of the powerful tools of statistical physics is potentially extremely promising. The work done in the LPT has already led to important new insight into several properties of DNA, notably its thermal denaturation by illuminating the role of the coupling between the three-dimensional non-uniform statistical bending inside the DNA and the opening and closing of base pairs ; and their adsorption processes on surfaces. An analogy with cluster phases in colloidal physics has led to important advances in the understanding of the dynamical self-organisation of bio-membrane proteins. Studies on the electropermeabilisation in biological membranes, in close collaboration with one of the world leading experimental groups, can have high significance for cancer and gene therapy. Finally, pioneering studies on the non-equilibrium Casimir effect in soft matter include the first ever analysis of the Casimir effect in disordered systems. It is planned to continue on all these lines, one route being the systematic development of well-devised coarse-grained descriptions.

Stochastic processes and disordered systems. The study of persistence probabilities (both local and global) has since its beginning been one of the specialities of present and former members of the LPT whose work has been essential for reaching the current understanding of the subject. A new breakthrough has been realised by relating the persistence probabilities to the extreme-value statistics. Conceptually important advances have been made for a better characterisation of structural glass transitions by analysing sub-diffusive behaviour at low temperatures. Results include a derivation of the classical Vogel-Fulcher relation from a specific model and an analysis of the number of critical points of Gaussian random fields. It is planned to use the expertise to deepen current understanding of dynamical phase transitions, through analogies with quantum systems. An unconventional, but timely, application of the techniques of statistical mechanics concerns recent advances into the theory of competition and the leader problem. Another innovative important result concerns the large deviation properties of the spectrum of random matrices.

Systems with long-ranged interactions. Many-body systems with long-ranged interactions occur very frequently in nature, but their statistical description is difficult in that many of the basic results of conventional statistical mechanics need no longer be valid. The analysis of simple-looking, but subtle Hamiltonian mean-field models has shown that such systems may relax towards quasi-stationary states no longer described by a Boltzmann distribution and with a quite non-trivial phase diagram with counter-intuitive multiple re-entrant transitions. An interesting analogy between self-gravitating Brownian particles and the chemotaxis of populations of bacteria has been found and studied. Kinetic theories of these systems (and their astrophysical applications) are currently under active study, as well as the role of fluctuations.

Altogether, the work performed is truly impressive in its wide span of very different topics in theoretical statistical physics, which are treated in depth and on the outer frontier of current research. The scientific productivity of the members of the group is outstanding and their international recognition is amply documented through many invited conferences. Their active involvement in teaching and important and time-consuming administrative tasks and their attractiveness to younger scientists is clearly shown through the numerous doctoral theses either in active preparation or completed and the post-docs present in the group. This is all the more remarkable since the average number of authors on an article from the LPT is just below 3 (and ≈1.3 permanent researchers at LPT). They have also known how to manage an impressive number of research contracts (ANR etc.) and do invest considerable effort to maintain a very high level of international cooperation.

Summarising, the work of the group PHYSTAT in the LPT is extremely interactive, instructional and important, highly innovative.

The group **`Finite Fermionic Systems'** (CLUSTERS) is the smallest group of the LPT, being composed of one professor and one maitre de conferences. The group develops formal aspects of (time-dependent) density functional theory [(TD)-DFT], applications to metal clusters (especially under intense laser irradiation) and molecules of biological interest, as well as effects of environment (e.g. substrate). It has a very strong publication record including publications of high impact and review articles, testifying of a continuous, productive and equilibrated activity. Despite its small size (see comments in detail below) it touches upon several subjects that are today timely and important. Three points can be in particular underlined :

Self-interaction corrections. Most approximate functionals currently used in DFT and TD-DFT suffer from the fact that approximations to exchange and correlation lead to an insufficient cancellation of the self-interaction contribution in the standard Hartree term. This can introduce severe errors, especially in the presence of relatively localized electrons. Self-interaction corrections (SIC) of different kinds have been used for many years, but the topic has regained much interest more recently because of its importance for strongly correlated materials. The 'CLUSTERS' group has recently achieved significant progress in treating SIC by introducing a variational formulation and an improved propagation scheme. Success in this direction may impact a community well beyond the one of metal clusters.

Time-dependent and ultrafast phenomena. Recent years have seen spectacular experimental developments in the field of time-dependent spectroscopy and lasers. There is a strong need for theory to help explore the frontier of knowledge. In principle, TD-DFT allows one to accompany many of those measurements, and the group, with its long-standing experience in the field, is well placed to play an important role. They have given in particular numerous contributions to describe and understand time-dependent phenomena in clusters.

Hierarchical modelling. Quantum mechanics at the nano-scale is crucial to understand phenomena such as optical absorption, the creation of irradiation defects, or proton transfer; however, the systems of practical interest, in particular in the field of biology, are in general much too complex to be treated straightforwardly. Sometimes the system can be broken down into smaller units and only an "active" one treated explicitly; most often however, even when this is possible, the rest of the system has to be included at least on an approximate (e.g.macroscopic) level. With the worldwide ambition to push interdisciplinary research, hierarchical modelling has therefore become one of the hot topics. The move of the group in this direction is a logical consequence of its centers of interest and competences.

Note de l'unité	Qualité scientifique et production	Rayonnement et attractivité, intégration dans l'environnement	Stratégie, gouvernance et vie du laboratoire	Appréciation du projet
A+	A+	A+	A+	A+

Université Paul Sabatier
TOULOUSE III

Direction de la Recherche

Toulouse, le 22/02/2010

Affaire suivie par
Ghislaine MACONE-FOURIO
téléphone
05 61 55 66 05
télécopie
05 61 55 69 53
courriel
seccs@adm.ups-tlse.fr
GF/GMF/FW

Le Président de l'Université

au

Président du comité d'experts de l'AERES

Objet : Observations de portée générale sur le rapport d'évaluation
de l'unité **« Laboratoire de Physique Théorique » (LPT) – UMR 5152**
portée par **Clément SIRE**

L'université Paul Sabatier et le LPT prennent acte de cette version préliminaire du rapport d'évaluation AERES pour le LPT, que l'on peut objectivement caractériser de très positive. Vous trouverez ci-dessous quelques remarques mineures concernant son contenu.

- Au bas de la page 4 « ... ANR grants » et en page 5 « ...through 7 ANR grants... » : l'obtention de deux contrats européens (dont le « gros » contrat EuroSQIP de l'équipe *Quantware*) pourrait aussi être mentionnée.

- Premier paragraphe de la page 6, « recommandations » : depuis la création du LPT, l'équipe *Cluster* est en **fait officiellement associée à la Section 04** du CoNRS (qui devrait donc être mentionnée) et aussi depuis 2008 à la Section 05 (celle-ci concerne aussi l'équipe *PhyStat*). Il est correct que la Section 02 n'est pas vraiment représentative de cette activité. En fait, l'une des difficultés de cette équipe est qu'elle n'est justement pas pleinement associée à une communauté bien rattachée à une section précise du CoNRS. Cette équipe officie aussi bien dans le domaine de la physico-chimie qu'en physique atomique ou en physique de la matière condensée, comme en témoigne ainsi la diversité des journaux où cette équipe publie et la diversité des conférences où elle intervient (voir document bilan). À noter qu'en cette année 2010, et pour la première fois en Section 04 du CoNRS, cinq candidats se présentent au LPT sur les thèmes *agrégats* et *atomes froids*, deux priorités clairement affichées dans le projet du LPT (d'autres candidatures sur ces deux thèmes en Sections 02 et 05).

.../...

- Page 8, évaluation de l'équipe *Quantware* : l'implication autour des atomes froids de cette équipe (5 publications récentes) pourrait être mentionnée en parallèle à celle de l'équipe *FFC*, et notamment la proposition d'observer la transition d'Anderson 3D dans des atomes froids (réalisée par le groupe de Jean-Claude Garreau à Lille, en 2009) qui fut d'ailleurs relevée dans les *highlights* du site Web de l'APS, ou la proposition d'un nouveau mécanisme de refroidissement exploitant la réversibilité de la mécanique quantique (par rapport à un système classiquement chaotique). Par ailleurs, une collaboration effective sur la diffusion d'un condensat de Bose-Einstein par une impureté a démarré avec le groupe *Atomes Froids* du Laboratoire Collisions Agrégats et Réactivité (UMR UPS/CNRS), laboratoire également rattaché à la fédération de recherche IRSAMC.

- Sous le tableau de la page 7, *Data on work produced for the report*, il pourrait être noté que quatre thèses de doctorat et une thèse d'HDR ont été soutenues en 2009, tout juste après la période visée par cette évaluation (juin 2005-juin 2009). Pour information :

- Ludovic Arnaud, *Étude de l'interférence et de la décohérence en informatique quantique*, thèse soutenue le 17/12/2009
- Clément Touya, *Diffusion dans des potentiels aléatoires non gaussiens*, thèse soutenue le 12/10/2009
- Jérémie Messud, *Correction d'auto-interaction dépendant du temps*, thèse soutenue le 28/09/2009
- Daniel Charrier, *Modèles effectifs pour les systèmes magnétiques frustrés*, thèse soutenue le 17/09/2009
- Mai Sève-Dinh : *Time-dependent density functional theory applied to molecules and clusters in contact with an environment*, HDR soutenue le 07/12/2009

- Page 6 « recommandations » sur les HDR : il paraîtrait approprié de mentionner que les chercheurs du LPT sont tout à fait conscients de l'importance de passer leur HDR et agissent en conséquence. M. Dinh l'a passée en décembre 2009 (voir ci-dessus), et M. Manghi doit la passer en mai 2010 (100 % des enseignants-chercheurs UPS du LPT auront donc leur HDR avant cet été). Concernant les chercheurs CNRS, B. Georgeot doit passer la sienne en mars 2010 et P.-H. Chavanis devrait en faire de même à l'automne 2010.

L'université Paul Sabatier et le LPT remercient le comité AERES pour la qualité de leur travail et vous adressent l'expression de leurs cordiales salutations.

Gilles Fourtanier