LERMA - Laboratoire d'étude du rayonnement et de la matière en astrophysique

Rapport Hcéres

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

Department for the evaluation of research units

AERES report on unit:

Laboratoire d'Etudes du Rayonnement et de la Matière en Astrophysique et Atmosphères

LERMA2

Under the supervision of the following institutions and research bodies:

Observatoire de Paris

Ecole Normale Supérieure

Université Paris 6 - Pierre et Marie Curie

Université de Cergy Pontoise

Centre National de la Recherche Scientifique

February 2013

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

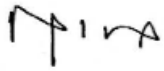
Research Units Department

President of AERES

Didier Houssin

Research Units Department

Department Head



Pierre Glaudes

The president of AERES "signs[...], the evaluation reports, [...]countersigned for each evaluation department by the relevant head of department (Article 9, paragraph 3, of french decree n°2006-1334 dated 3 november 2006, revised).

Grading

Once the visits for the 2012-2013 evaluation campaign had been completed, the chairpersons of the expert committees, who met per disciplinary group, proceeded to attribute a score to the research units in their group (and, when necessary, for these units' in-house teams).
This score (A+, A, B, C) concerned each of the six criteria defined by the AERES.
NN (not-scored) attached to a criteria indicate that this one was not applicable to the particular case of this research unit or this team.

Criterion 1 - C1 : Scientific outputs and quality ;
Criterion 2 - C2 : Academic reputation and appeal ;
Criterion 3 - C3 : Interactions with the social, economic and cultural environment ;
Criterion 4 - C4 : Organisation and life of the institution (or of the team) ;
Criterion 5 - C5 : Involvement in training through research ;
Criterion 6 - C6 : Strategy and five-year plan.

With respect to this score, the research unit concerned by this report (and, when necessary, its in-house teams) received the following grades:

- Grading table of the unit: LABORATOIRE D'ETUDE DU RAYONNEMENT ET DE LA MATIERE EN ASTROPHYSIQUE

C1	C2	C3	C4	C5	C6
NN	NN	NN	NN	NN	A+

- Grading table of the team: LERMA

C1	C2	C3	C4	C5	C6
A+	A+	A	A	A	NN

- Grading table of the team: LPMAA

C1	C2	C3	C4	C5	C6
A+	A	A	A	A+	NN

- Grading table of the team: P1 Galaxies et cosmologie

C1	C2	C3	C4	C5	C6
A+	NN	NN	NN	NN	NN

- Grading table of the team: P2 Dynamique du MIS et plamas stellaires

C1	C2	C3	C4	C5	C6
A+	NN	NN	NN	NN	NN

- Grading table of the team: P3 Molécules

C1	C2	C3	C4	C5	C6
A+	NN	NN	NN	NN	NN

- Grading table of the team: P4 Instrumentation et télédetection

C1	C2	C3	C4	C5	C6
A	NN	NN	NN	NN	NN

- Grading table of the team: P5 Services scientifiques et administration

C1	C2	C3	C4	C5	C6
NN	NN	NN	NN	NN	NN

Evaluation report

Unit name:	Laboratoire d'Etudes du Rayonnement et de la Matière en Astrophysique
Unit acronym:	LERMA2
Label requested:	UMR
Present no.:	8112
Name of Director (2012-2013):	Mr Michel PERAULT
Name of Project Leader (2014-2018):	Mr Michel PERAULT

Expert committee members

Chair:	Mr Jean-Marie HAMEURY, Université de Strasbourg
Experts:	Mr Sylvain BONTEMPS, Université Bordeaux 1
	Ms Cathy CLERBAUX, Université Pierre et Marie Curie
	Mr Jean-Louis COUTAZ, Université de Savoie
	Mr François-Xavier DESERT, Université Joseph-Fourier
	Mr Gary FULLER, University of Manchester, Royaume-Uni
	Ms Marie-Claire GAZEAU, Université Paris 12, Créteil (representing CNU)
	Mr Thierry PASSOT, Observatoire de la Côte d'Azur, Nice (representing CoNRS)
	Ms Dahbia TALBI, Université Montpellier 2
	Ms Valentine WAKELAM, Université Bordeaux 1 (representing CNAP)
	Mr Anthony WHITWORTH, University of Cardiff, Royaume-Uni

Observers :

Ms Claudine CREPIN-GILBERT, Université Paris-Sud (representing CoNRS)

Ms Marie-Renée DE BACKER, Université de Reims (representing CNU)

Scientific delegate representing the AERES:

Mr Michel BLANC

Representative(s) of the unit's supervising institutions and bodies:

Mr Claude CATALA, Observatoire de Paris

Mr Paul INDELICATO, Université Pierre et Marie Curie

Mr Werner KRAUTH, ENS/département de Physique

Mr Olivier La MARLE, CNES

Mr Yves LAZLO, ENS

Mr Denis MOURARD, CNRS/INSU

Mr Reynald PAIN, Université Pierre et Marie Curie

Mr Guy PERRIN, Observatoire de Paris

Mr Jean-Pierre REYES, CNRS/DR2

Ms Pascale ROUBIN, CNRS/INP

Mr Stéphane SERFATY, UCP

Mr Gilles TRAIMOND, CNRS/DR5

1 • Introduction

History and geographical location of the unit

The LERMA2 project results from the merging of two laboratories, LERMA and LPMAA.

LERMA is one of the laboratories of the Observatoire de Paris; it is located on 5 sites: mostly at the Paris site of the Observatoire de Paris and at the ENS (Paris), but also at the Meudon site of the Observatoire de Paris, at Cergy-Pontoise and at Ivry/Jussieu (Université Pierre et Marie Curie).

LPMAA is a laboratory located in Jussieu, under the supervision of CNRS and UPMC.

In this report, the past activities of both laboratories will be analyzed separately, and the analysis of the LERMA2 project will be detailed in section 2. Moreover, as the individual teams do not have an independent policy, most of the comments concerning *e.g.* the interactions with the socio-economic environment, internal organisation, training, will be discussed in the general laboratory section except where otherwise needed.

Management team

LERMA (present). Director: Mr M. PÉRAULT; deputy director: Mr L. PAGANI; technical director: Mr J.M. KRIEG

LPMAA (present). Director: Ms M-L. DUBERNET; technical director: Mr P. JESECK.

Project LERMA2. Director: Mr M. PÉRAULT; deputy directors: Ms M. GÉRIN, Ms C. BOURSIER, Mr F; DULIEU; technical director: Mr J-M. KRIEG.

AERES nomenclature

ST3 Earth and universe sciences

Unit workforce:

Unit workforce	Number as at 30/06/2012[1]	Number as at 01/01/2014[2]	2014-2018 Number of project producers[3]
N1: Permanent professors and similar positions	LERMA : 23 LPMAA : 10	30	28
N2: Permanent researchers from Institutions and similar positions	LERMA : 17 (16,8) LPMAA : 1	18 (17,8)	18
N3: Other permanent staff (without research duties)	LERMA : 32 (31,2) LPMAA : 9	35 (33,8)	9
N4: Other professors (Emeritus Professor, on-contract Professor, etc.)	LERMA : 13 LPMAA : 1	12	8
N5: Other researchers from Institutions (Emeritus Research Director, Postdoctoral students, visitors, etc.)	LERMA : 9 LPMAA : 0	5	9
N6: Other contractual staff (without research duties)	LERMA : 4 LPMAA : 3	3	0
TOTAL N1 to N6	**LERMA : 98 (97) LPMAA : 24**	**103 (100,6)**	**72**

Percentage of producers	***96 %***

Unit workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students	LERMA : 23 LPMAA : 5	
Theses defended	LERMA : 30 LPMAA : 5	
Postdoctoral students having spent at least 12 months in the unit*	LERMA : 6 LPMAA : 0	
Number of Research Supervisor Qualifications (HDR) taken	LERMA : 3 LPMAA : 3	
Qualified research supervisors (with an HDR) or similar positions	LERMA : 33 LPMAA : 6	36

2 • Assessment of the unit

Strengths and opportunities

Scientific excellence and interdisciplinarity are two clear very strong points of LERMA2. This is favoured by the scientific environment of the laboratory in the Paris area, where interactions with other astrophysics and physics laboratories are relatively easy, and contacts with excellent students simple. This could have been better acknowledged in the SWOT analysis. The conjunction of top-level scientists engaged in top priorities of astronomy and the availability of new w*orld* class facilities (*e.g.* Herschel, Planck, Alma, and NOEMA) accounts for the past successes of the laboratory and prepares well for a bright future.

The committee also believes that the merging of LPMAA and LERMA has been well prepared and gives excellent opportunities to the future laboratory to develop strongly visible activities at the interface between molecular physics, astrophysics and atmospheric sciences.

The committee is happy to see that many recommendations from the previous LERMA visiting committee (four year ago) have been implemented. In particular the organisation in poles is seen by the committee as a very efficient move.

Weaknesses and threats

The complexity of the laboratory, with 5 sites, located on the premises of two universities, one « grand établissement » and one « école normale supérieure » makes the management of the laboratory difficult and the coordination of the policies of those 4 institutions plus CNRS an issue. Clearly, this does not impact the scientific production of the laboratory, and decreasing significantly the number of sites does not seem possible on the short/medium term.

LERMA2 also covers a large number of themes, ranging from cosmology to the Earth atmosphere. While there is a clear link between these themes which are connected in part by observation techniques, setting long term priorities in coordination with all institutions involved in LERMA2 and having a stronger focus on these, would be needed.

The visiting committee noted that the project does not develop a long term strategy, but is essentially based on the continuation of existing activities. This is neither unusual nor unexpected in domains for which programming is not central (as *e.g.* in instrumentation). The committee believes that NOEMA could be an example of such potential developments which could involve several poles. NOEMA is indeed mentioned in the project, but could have been given more emphasis. In a context where top-level senior scientists will leave, this will be of particular importance, as new opportunities might appear for their replacement. The recruitment plan, in particular for the research staff, has suffered from the absence of priorities, and, as it is now, is unrealistic.

Recommendations

- Do not increase the complexity of the laboratory;
- Set long term priorities (see above). The opportunity offered by the possibility of a senior appointment at ENS must be carefully studied;
- Site communication still requires efforts. The organisation of internal meeting days every year must be a priority, even in financially difficult times. In the same vein, more meetings involving several sites should be organized, and an efficient video-conference system would be most helpful in this context. Video-transmission of seminars is an option which could also be considered;
- Give the students an opportunity to visit all sites;
- The management is encouraged to develop the scientific life in the poles which are relatively broad in terms of thematic range and are scattered over sites which can be distant;
- The role of various bodies (laboratory council, executive committee, site directors …) should be clarified and understood by everybody. The visiting committee was for example unsure that the site directors should be allowed to take strategic decisions;
- In each site, try to find office space for staff from another site;
- The availability of office space has become critical and should be addressed by hosting institutions in a coherent way.

3 • Detailed assessments of the existing LERMA

Assessment of scientific quality and outputs

The scientific production of LERMA is outstanding, with more than 150 refereed publications per year on average, or approximately one publication per year per permanent researcher having a LERMA member as first author. This is significantly above the French average in astronomy. The number of citations per paper is also high, ranging from 15 (papers published in 2011) to 20 (papers published in 2007). As a comparison, the average number of citations of papers published in Astronomy and Astrophysics in 2011 is slightly less than 9.

The scientific output of LERMA is also large in domains such as instrumentation, with for example the delivery of two SIS mixers of Herschel HIFI band 1, which was done during the period 2003-2007, but obviously contributed to the scientific success of Herschel during the present period. The production of databases (*e.g.* GALMER, VO databases) which are widely used by researchers from other institutions all over the world is another example of such a production extending beyond the usual acceptation of scientific production.

Assessment of the unit's academic reputation and appeal

Many scientists from LERMA have a well-established international reputation and visibility. The number of citations per paper is of course a measure of this recognition. The fact that LERMA hosts 2 ERC grants (one advanced grant and one starting grant), plus the number of projects funded by ANR (11 over the 2007-2011 period, and participations in several LABEX), or by other funding sources, as well as the fact that half of these (including one LABEX) are under the leadership of LERMA, the participation of LERMA members in international committees or academies (*e.g.* the French Academy of Sciences or the Royal Astronomical Society) demonstrate very clearly the recognition at the national and international level of the excellence of a significant number of the LERMA staff. As a consequence, the laboratory is able to attract well-known scientists as short term visitors, and the number of applications to post-doctoral positions opened in LERMA is also very large, up to more than 100 in one case. Very clearly, there are a few top world class scientists in the laboratory, and at the same time, the average visibility of the other researchers is high.

As a consequence, the laboratory is quite well-funded by external contracts, and is wealthy. The uneven distribution of post-docs between the different teams does not seem to create internal tensions.

Assessment of the unit's interaction with the social, economic and cultural environment

LERMA is one of the very few laboratories in Astronomy in which a spin-up company (Estellus) has been created, providing services in atmospheric and environmental sciences. Tight connections also exist between the R&D/instrumentation group and industrial partners, and the number of applications outside the academic field of technologies developed in LERMA is potentially large. The staffing of the team involved in the THz developments is limited however, as compared to what exists in other laboratories with activities in this domain, and is unlikely to increase by a large factor. The visiting committee therefore recommends setting priorities and organizing the technical developments in such a way that the top priorities are above the critical mass.

Outreach is well-organized at the laboratory level, and is a strong point. LERMA is for example coordinating the European project EU-HOUMW which consists in developing and operating small radio-telescopes, one of them being located in the Paris observatory, conceived for education, and has been involved, at high levels, in other projects. It is worth noting that some of the top LERMA scientists play a very active role in this domain. The visiting committee has been impressed by the activities in this domain, and congratulates the direction and the whole staff of LERMA for their efforts.

In this context, the web pages of the laboratory are very disappointing and do not reflect the current activities in the laboratory and not even its actual structure. Given the complexity of the laboratory and the need to have efficient internal communication channels, the LERMA management should urgently change this situation. The committee was informed that this was indeed one of the short term actions foreseen, and the merging with LPMAA could be a good opportunity to install a new website.

Assessment of the unit's organisation and life

The visiting committee noted and appreciated that recommendations from the previous visiting committee had been taken into account and implemented, resulting in a very positive evolution. Some progress is still desirable though.

The committee noted that the staff has, with very few individual exceptions, very little concerns. The laboratory is viewed as wealthy, and the workload on both the administrative and technical staff seems to be acceptable, indicating no major staffing problem.

The "Conseil de laboratoire" does not play its role, as its involvement in the definition of *e.g.* scientific priorities, long term strategy, etc. is relatively small. It is kept informed by the management, but is neither active nor proactive. The current council members and the general laboratory staff do not seem to consider this as a problem, which could also be a concern. A likely explanation for this would be that the management decisions are generally accepted by the staff, and perhaps also that LERMA staff is focused on scientific productivity. In any case, a clarification of the role of the "Conseil de laboratoire" should be made and accepted by everybody. The management practice should then be in agreement with existing texts. The merging with LPMAA, where the practice is quite different, makes this clarification even more important.

Assessment of the unit's involvement in training through research

LERMA is traditionally heavily involved in training by research at doctoral level. One LERMA membre (P. Encrenaz) was the directore of the doctoral school Astronomie et Astrophysique d'Ile de France (ED 127) for many years. And during the reporting period, two LERMA members have been acting as members of the boards of the doctoral scools ED 389 (La Physique de la Particule à la Matière Condensée) and 417 (École Doctorale Sciences et Ingénierie). 60% of the PhD students were enrolled in École Doctorale ED 127, Astronomie et Astrophysique d'Ile de France, while the other 40% belonged to one of 8 different ED's, namely: ED 129, 389 or 417 (to which LERMA is officially affiliated), ED 107 or ED 381 (alternative doctoral schools in physics at ENS and UPMC), and, for a very small number of theses in cosupervision with external institutions, ED 52, 227, or 422 (respectively with ENS Lyon, Museum National d'Histoire Naturelle, and Orsay University).

The involvement of LERMA in training activities is quite good. The committee had a positive appreciation of the fact that a fraction of the teaching was made in « classes préparatoires ». A solution should be found for finding shared office space on university premises for all teaching staff.

The number of PhD students is still relatively low (23 on 30/6/2012); at the time of the previous visiting committee, there were 22 PhD students, and it was recommended to increase this number. Efforts should be made to attract students from engineering schools in the instrumentation team, at a time when these schools start considering that a PhD can be a valuable addition to their diploma.

The visiting committee also supports the director's efforts to have more people having their HDR.

Assessment of the five-year plan and strategy

See section 2 "assessment of the unit" above.

4 • Detailed assessments of the existing LPMAA

Assessment of scientific quality and outputs

LPMAA is an excellent fundamental research laboratory in molecular physics and fundamental/applied spectroscopy with applications to atmospheric physics, astrophysics and environment research.

LPMAA is led by dynamic and young scientists. The number of publications is high, with an average of 21 publications in refereed journals per year, among which 9 having a first author from LPMAA. Given the fact that all but one of the present LPMAA staff have heavy teaching duties and that the laboratory had to move during the reference period, this is an achievement. The committee noted, however, that this high number of publications is unevenly distributed.

The strength of this laboratory is its scientific excellence, with applications ranging from space to our atmosphere, its ability to produce reference data and to undertake the technological developments needed for its research.

Assessment of the unit's academic reputation and appeal

The LPMAA scientists benefit from a high visibility at the national and international levels. This can be measured by, for example, the number of ANR projects (3, among which 2 have a PI from LPMAA), contracts from other sources, including the Canadian Space Agency, the fact that the director of LPMAA is the coordinator of the FP7 project VAMDC or the fact that members of LPMAA are members of various scientific committees.

Another indication of the visibility of the laboratory is the co-supervision of a thesis between the Netherland and LPMAA on desorption processes induced on cold ices by UV photons.

Assessment of the unit's interaction with the social, economic and cultural environment

There is nothing above what is expected from a laboratory of this size and type to note in this domain.

Assessment of the unit's organisation and life

The laboratory being small, the decision process involves the General Assembly (meetings every two months) where budgets, recruitments, scientific priorities, and political orientations are discussed. The internal communication is handled through the General Assembly, coffee breaks and internal meetings.

LPMAA is a small group, well organized, where decisions are obviously taken in a consensual way. It was for example quite clear, from the discussions the committee had with the staff and management, that the merging with LERMA has been well prepared by thorough discussions covering all possible issues, and involving everybody. The committee noted that although the move back to Jussieu had a significant impact on the laboratory activity, this was organized in such a way as to minimize it, with a collective approach of the various problems.

Assessment of the unit's involvement in training through research

LPMAA is affiliated to ED 389 (La Physique de la Particule à la Matière Condensée).

All permanent research staff but one having teaching duties, it is no surprise that the involvement of the laboratory in teaching is strong. The number of PhDs supervised, in view of the low number of HDR, is fair. The committee was impressed by the number of trainees at the Licence and Master levels.

Assessment of the five-year plan and strategy

See section 2 "assessment of the unit" above.

5 • Team-by-team analysis

The laboratory has chosen to label its teams "poles". In the following, the word "pole" is in general used to refer to a specific team, e.g. "Pole 1", whereas "team" is ised in a more generic sense.

Team 1 : Galaxies and Cosmology

Name of team leader: Mrs Françoise COMBES

Workforce

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014	2014-2018 Number of project producers
N1: Permanent professors and similar positions	4,5	4,5	4,5
N2: Permanent EPST or EPIC researchers and similar positions	3	2,5	2,5
N3: Other permanent staff (without research duties)	0	0	0
N4: Other professors (PREM, ECC, etc.)	4,5	6	6
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	4	1	1
N6: Other contractual staff (without research duties)	1	1	0
TOTAL N1 to N6	**17**	**15**	**14**

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students	3	
Theses defended	7,5	
Postdoctoral students having spent at least 12 months in the unit	4	
Number of Research Supervisor Qualifications (HDR) taken	1	
Qualified research supervisors (with an HDR) or similar positions	6	5,5

• Detailed assessments

Strengths and opportunities

This Pole covers many aspects of modern extragalactic and cosmological research, including the primordial universe, the Cosmic Microwave Background anisotropies, the epoch of reionization, high redshift galaxies, clusters of galaxies and the dynamics of local galaxies. The major highlights comprise the achievements obtained with the Planck ESA satellite for cosmology (other LERMA researchers in Pole 2 exploit the data for galactic science), accurate simulations of the 21cm HI line in absorption and emission during the epoch of reionization with consequences on the design of SKA, the first detection of molecular CO gas in cooling flows in the centre of galaxy clusters as well as the importance of the AGN feedback to trigger the flows, and the study of streams of stars as observed with Megacam on the CFHT, degrees away from the Andromeda Galaxy, to the nature of the dark matter (cosmology within the local universe).

Pole 1 thus has a multi-focused approach in extragalactic studies, using in a coherent way theory, simulations, observations and instrumentation to tackle a clear-cut problem. The 2010 ERC in Pole 1 with about 10 post-doctoral fellows shows its attractiveness and international standing, as well as the participation in 6 ANRs. Heavy numerical studies (using National GENCI facilities, and PSL and ERC Momentum mesocenters) are among the core of Pole 1 activities.

Involvements in "Hands-on Universe" and AMA09 (World Year of Astronomy) are among the activities which demonstrate the role of Pole 1 in outreach activities.

The project of pole 1 is basically to continue the gold mining in the Herschel and Planck datasets, the numerical simulations, and observations with world-class telescopes (ALMA, IRAM, ESO, CFHT), especially in the (sub)millimetre domain, and on the longer term in the centimetre domain with SKA.

Weaknesses and threats

Pole 1 has a world-class reputation and scientific production which should be continued as far as it is possible. In this context, it is important to envision the evolution of the group after the end of the present ERC, and on the longer term when senior researchers may have retired. The scientific questions approached by the group are diverse, from cosmology to CO in nearby galaxies. This is a priori good but it might also be dangerous if individuals independently develop their own research separately from the rest of the pole members.

Recommendations

A reflection to reinforce and better prioritize projects and define the group core activities is important to ease the mid- to long-term evolution of the pole. Also since the group is mostly working on the ISM in galaxies, it could be interesting to develop more direct collaborations with activities in Pole 2. Teaching is important (with about 500 hours TD per year) in the group, but training through research could be improved with 1 or 2 more PhD students. It is for instance seen as a pity that the ERC does not employ any PhD student to fully benefit from the exciting, present-day scientific activity of the group with as many as 10 post-docs.

Team 2 : Dynamics of the ISM and stellar plasmas

Name of team leader: Ms Sylvie CABRIT

Workforce

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014	2014-2018 Number of project producers
N1: Permanent professors and similar positions	8	7	6
N2: Permanent EPST or EPIC researchers and similar positions	9,5	9,5	9,5
N3: Other permanent staff (without research duties)	0	0	0
N4: Other professors (PREM, ECC, etc.)	4	3	2
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	3	2	3
N6: Other contractual staff (without research duties)	0	0	0
TOTAL N1 to N6	**24,5**	**21,5**	**20,5**

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students	9	
Theses defended	9,5	
Postdoctoral students having spent at least 12 months in the unit	2	
Number of Research Supervisor Qualifications (HDR) taken	1	
Qualified research supervisors (with an HDR) or similar positions	15	15

• Detailed assessments

Strengths and opportunities

This Pole is central to the LERMA activity, since it is concerned with scales intermediate between those of Poles 1 and 3. It is also arguably the pole that combines the widest range of techniques, from multiwavelength observations and laboratory experiments at one extreme, to theory and numerical simulation at the other. Not only are the talented individuals involved in this node delivering research that is of the very highest quality and profound international impact, they are also very adept at exploiting the advantages to be gained by combining their different approaches in imaginative ways. Central to the activity are detailed magneto-hydrodynamic simulations, coupled with sophisticated thermal, chemical and radiative schemes, which are shedding new light on the dynamics of the interstellar medium, the collapse of prestellar cores, the formation and evolution of circumstellar discs, the physics of protostellar jets and outflows, and the transport processes operating in stars. A major highlight is the work on turbulent dissipation in molecular clouds, which has established the different mechanisms at work, and – by modeling the detailed space and time-dependent chemistry - determined the observational signatures of this critical process, and explained the formation of CH+, HCO+, CO and rotationally excited H2. A second highlight involves controlled plasma experiments being performed in the laboratory, that are analogues of the mechanisms presumed to operate in interstellar and circumstellar space and serve not only to give crucial insights into, for example, protostellar jets and shocks, but also to provide checks on the fidelity of the magneto-hydrodynamic code. Other highlights include the observation of mid-infrared coreshine and the implications for the size distribution of dust grains; and the modeling of isotopic fractionation and ortho-para ratios, and their use as chemical clocks to constrain the ages of prestellar cores.

The addition of a small team working on the ISM coming from LUTH, another laboratory of Paris Observatory, will help strenghtening Pole 2, and will favour LERMA2 participation in the development of the theoretical virtual observatory.

Weaknesses and threats

Our only significant concern with this Pole is that two senior members have recently left (for jobs that afford them better pay and working conditions, and more time for research); a third senior and highly active member of the team has recently retired, and whilst we are confident that the contributions of these individuals to the research of LERMA2 will continue in the short term, it is essential that coherent plans for their replacement in the medium term be carefully formulated and vigorously implemented. There are some very bright young scientists in the group, but, without new appointments - including at least one senior to provide vision, guidance, and leadership - the momentum of the group is unlikely to be maintained. This would be a great loss, both to French astronomy, and to the wider international astronomy community.

Recommendations

The proposed future program aims to continue exploring many of these successful areas. However with the demise of Planck and Herschel, the Pole needs to be careful to develop strategies to replace the important role these instruments have played within the science of the pole.

Team 3 : Molecules

Name of team leader: Mr Jean-Hugues Fillion

Workforce

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014	2014-2018 Number of project producers
N1: Permanent professors and similar positions	LERMA : 9 LPMAA:10	17	16
N2: Permanent EPST or EPIC researchers and similar positions	LERMA : 1 LPMAA : 1	2	2
N3: Other permanent staff (without research duties)	LERMA : 1 LPMAA : 9	4	3
N4: Other professors (PREM, ECC, etc.)	LERMA : 1 LPMAA : 1	2	0
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	LERMA : 2 LPMAA : 0	2	3
N6: Other contractual staff (without research duties)	LERMA : 0,5 LPMAA : 3	2	0
TOTAL N1 to N6	**LERMA : 14,5 LPMAA : 24**	**29**	**24**

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students	LERMA : 4 LPMAA : 5	
Theses defended	LERMA ; 8 LPMAA : 5	
Postdoctoral students having spent at least 12 months in the unit	LERMA : 0 LPMAA : 0	
Number of Research Supervisor Qualifications (HDR) taken	LERMA : 0 LPMAA : 3	
Qualified research supervisors (with an HDR) or similar positions	LERMA : 7 LPMAA : 6	12

• Detailed assessments

The research activity of pole 3 is dedicated to molecular physics applied to astrophysics and Earth atmosphere. This activity is strongly interdisciplinary, connecting physics and chemistry, astrophysics and even technological development. The pole gathers theoreticians and relies upon innovative experimentation, sophisticated molecular physics calculations and high-resolution spectroscopy studies to understand the fundamental mole-cular processes occurring in various space environments both in the gas phase and on grains.

Significant successes have been achieved in LERMA over the last five years. These include: 1) ultra-high precision HD lines measured at extreme UV wavelengths, providing a database for comparison with high-redshift quasar spectra in order to probe possible proton-electron mass ratio variations on a cosmological time scale; 2) accurate collisional rate coefficients computed for the rotational excitation of SO2 by o/p-H2 giving new absorption and maser line profiles that will be useful to trace physical conditions of the ISM; 3) successful experimental synthesis of H2, H2O, CO2 and NH2OH on cold dust grains analogs; 4) sticking measurements of H2, D2 on amorphous water ice and silicates, revealing important Isotopic effects. The number of publications for this pole is large despite heavy teaching duties that most members of the pole face all over the year.

Activities at LPMAA include ultra-high resolution and precision spectroscopy for spectral parameter determination of molecules for climate researches, isotopic ratio measurement in atmospheric CO2, running the Qualair FTS ground based station, experimental studies on the nuclear spin relaxation in small hydrogenated molecules induced by interaction with solids, experimental studies on the photon induced processes on cold ices, collisional rate coefficient calculations, maintenance of a database of atomic and molecular collisional rates (BASECOL) and finally creation, organization, coordination and scientific contribution to building the Virtual Atomic and Molecular Data Center VAMDC (EU funded project).

The strength of the pole relies upon the combination of its expertise on both theoretical and experimental molecular physics which can address new issues raised by observations, and its inclusion in an astrophysics laboratory where results can be assessed through astrophysical modeling. Its deep involvement in teaching at both the undergraduate and graduate level helps in maintaining tight contacts with students and in sustaining a steady flow in Master 2 or PhD training.

The geographical dispersion of the pole (theoreticians are located in Meudon while most experimentalists are in Cergy-Pontoise, and the LPMAA team is located in Paris) has not prevented the construction of a strong thematic coherence, which could falter with time if members of the pole have no common space where they could meet regularly; this shared place could be in Paris, which would also reinforce exchanges with astrophysicists of pole 2. The committee also noted the need to reinforce the surface reactivity group in Cergy-Pontoise by recruiting on a permanent position an engineer for managing the experimental platform.

One should finally note the deep involvement in training through research at the undergraduate (L) and Master (M) levels as well as PhD thesis supervisions (during the last 5 years, 8 theses have been defended and 4 are in progress). One can list the management of a Master 2 at the University of Cergy-Pontoise, the management of a « Classes préparatoires aux Grandes Ecoles», management duties in two "Ecoles Doctorales", editorial activities and a participation to the creation and the use of a web site for e-learning in astrophysics.

Strengths and opportunities

The merging of LPMAA and pole 3 of LERMA will bring together leading research groups in quantum physics/chemistry, low temperature physics, chemical physics as well as surface science researchers. This will strengthen the research activities of both parts with new synergies already emerging also with other poles of LERMA. The effort made by the theoreticians to enlarge their activities toward the modeling of reactive processes on surfaces is noted and strongly encouraged.

Weaknesses and threats

The committee has some concerns about the future of the atmospheric activities which are rather isolated in the pole.

Recommendations

CNRS and UPMC should decide on whether they want atmospheric activities to continue, and if the answer is positive, keep the team above the critical mass; the development of collaborations with the atmospheric component of Pole 4 or with other laboratories in the Paris area are possible options.

Team 4 : Instrumentation and remote sensing

Name of team leader: Ms Catherine PRIGENT

Workforce

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014	2014-2018 Number of project producers
N1: Permanent professors and similar positions	1,5	1,5	1,5
N2: Permanent EPST or EPIC researchers and similar positions	3	3,5	3,5
N3: Other permanent staff (without research duties)	9,5	7,5	4,5
N4: Other professors (PREM, ECC, etc.)	3,5	1	1
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	0	0	0
N6: Other contractual staff (without research duties)	2	0	0
TOTAL N1 to N6	**19,5**	**13,5**	**10,5**

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students	7	
Theses defended	5	
Postdoctoral students having spent at least 12 months in the unit	0	
Number of Research Supervisor Qualifications (HDR) taken	1	
Qualified research supervisors (with an HDR) or similar positions	4,5	4

• Detailed assessments

Pole 4 of LERMA is dedicated to researches in instrumentation, including both hardware and software activities, and in Earth and planet remote sensing. The pole is organized along 3 teams working, respectively on - THz components and instrumentation, - Earth and planet remote sensing, and - software. Because of its technological objectives, Pole 4 incorporates a technical staff more numerous than the other three.

The THz instrumentation group has produced significant achievements during the 2007-2012 period, based on a unique expertise and know-how in high-frequency devices and systems for radio-astronomy. The group has supplied several programs like HIFI on Herschel with state-of-the-art components, for example SIS mixers (the components were delivered prior to 2007 and went through tests in 2007). The group is involved in several new projects, like CIDRE, JUICE and ISMAR. With the technical help of LPN in Marcoussis, the group is now producing mixers and sources, based on SIS, Schottky diodes and HEB, which are among the best in the world. The recently achieved 4-microW power for an electronic source (developped in collaboration with JPL) operating at 2.5 THz and at room temperature is really impressive.

The team working on Earth and planet remote sensing is strongly involved in European programs devoted to the observation and modeling of Earth atmosphere in the microwave spectral range. The strength of the team is mostly related to the analysis of ice clouds, for which remarkable scientific strides have been made. The second strong topic studied by the team is the study of Earth surface parameters, like wetland extend, soil moisture, etc. This domain is also very active, with good achievements and participation to several international projects. The team is also working on planetary observation, by contributing to programs like Cassini and Rosetta.

The software instrumental activity deals with processing and storing astrophysical data supplied either by instruments or by numerical simulations. The team is contributing to the creation of new international standards and to the establishment and diffusion of databases.

The committee has noted the excellent scientific production of the THz and remote sensing teams. The links between the 3 teams of the pole can certainly be tightened. The THz team is facing both the departure of two of its major members, namely P.Encrenaz and G.Beaudin, as well as uncertainties in the programming of space projects which, with the notable exception of SWI on JUICE, are not yet decided. On the other hand, the superb performance of the produced devices may find numerous applications in non-astrophysical domains, like security, sensing for the industry, etc. Such devices may also be used for Earth observation from satellites, without needing large additional developments. Whether this is the role of LERMA2 is an open question, and transferring part of this activity to more applied laboratories could be considered. If this activity were to remain as a foremost one in the laboratory, the team should be reinforced in order to remain competitive with existing teams in other laboratories.

Strengths and opportunities

The committee has noted the excellent scientific production of the THz and remote sensing teams.

Weaknesses and threats

The links between the 3 teams of the pole can certainly be tightened.

Recommendations

If this activity were to remain as a foremost one in the laboratory, the team should be reinforced in order to remain competitive with existing teams in other laboratories.

Team 5 : Scientific services and administration

Name of team leader: Mr Michel PÉRAULT

Workforce

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014	2014-2018 Number of project producers
N1: Permanent professors and similar positions	0	0	0
N2: Permanent EPST or EPIC researchers and similar positions	0,5	0,5	0,5
N3: Other permanent staff (without research duties)	21,5	23,5	2,5
N4: Other professors (PREM, ECC, etc.)	0	0	0
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	0	0	0
N6: Other contractual staff (without research duties)	0,5	0	0
TOTAL N1 to N6	**22,5**	**24**	**3**

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students	0	
Theses defended	0	
Postdoctoral students having spent at least 12 months in the unit	0	
Number of Research Supervisor Qualifications (HDR) taken	0	
Qualified research supervisors (with an HDR) or similar positions	0,5	0,5

• Detailed assessments

This is not a scientific team, but it is organized as a separate "pole" in LERMA, and needs therefore to be assessed as such.

The creation of a specific pole gathering the administrative and technical staff is seen by the committee as a positive move. This has happened in many other laboratories, and has been quite beneficial in these. An additional advantage in the case of LERMA2 is that it will promote discussions between technical staff working in different poles and sites. It has created some concerns among the staff, which is not a surprise, as this also happened in all places where this organization has been put in place. However, the committee has not seen any strong opposition from the staff. The committee therefore encourages the LERMA2 management to develop discussions and meetings with the staff, and agrees with the gradual approach adopted by the management.

The committee had little to say on the organization of the so-called « services d'observation » which are defined and assessed at the national level by CNRS/INSU. It encourages however the LERMA2 management to evaluate the workforces involved in each activity, their visibility and scientific impact, and eventually set priorities. This is apparently the management's approach, and most of the elements needed to have this evaluation made are already available.

6 • Conduct of the visit

Visit dates:

Start:	Wednesday 13 February 2013 at 9:00
End:	Friday 15 February 2013 at 12:30

Visit sites:

Institution:	Observatoire de Paris
Address:	77 av. Denfert Rochereau, 75014 Paris

Second site:

Institution:	Ecole Normale Supérieure
Address:	24 rue Lhomond, 75005 Paris

Third site:

Institution:	Université Pierre et Marie Curie
Address:	4 Place Jussieu, 75005 Paris

Specific premises visited:

Physical visits of 3 of the 5 sites, in particular:

- Laboratory experiments at University Pierre et Marie Curie (Jussieu)
- Clean room and instrumental developments in Observatoire de Paris (Denfert Rochereau)
- ENS premises, and computer facilities
- Virtual visit of laboratory experiments at the Cergy site

Conduct or programme of visit:

The visit began by a series of presentations of both laboratories and of the thematic poles, during mid-afternoon of the first day. This was followed by visits on the various sites attended by subgroups of the committee split in two parts. The afternoon of the second day was devoted to the formal meetings with staff categories and representatives of the overseeing institutions. The internal discussions of the committee took place during the evenings of the first and second days (about one hour each), and during the morning of the last day (8:30 – 12:30). Preliminary conclusions were then given to the laboratory staff by the visiting committee chair.

The detailed program of the visit is given below.

Comité de visite AERES du LERMA et du LPMAA
13 au 15 février 2013

Programme (version 3)

Mercredi 13 février

9h00 - 9h25	Huis clos initial du comité de visite
	(Salle de la Rotonde)
	Session plénière
9h30 - 11h00	Présentations générales
	(Salle du Conseil, retransmission Grande Galerie)
9h30	10 mn Intervention de M. Blanc, Délégué AERES et de J.-M. Hameury, Président du comité
9h40	25 mn Bilan du LERMA (M. Pérault directeur LERMA)
10h05	10 mn Bilan du LPMAA (M.-L. Dubernet directrice LPMAA)
10h15	20 mn Projet LERMA² (M. Pérault directeur LERMA)
10h35	25 mn Discussion générale sur les Bilans et le Projet
11h00 à 11h20	Pause
11h20 - 12h20	Présentations par Pôles Thématiques (première partie) (Salle du Conseil, retransmission Grande Galerie)
11h20	30 mn Bilan et projet Pôle 1 (F. Combes coordinatrice Pôle 1)
11h50	30 mn Bilan et projet Pôle 2 (S. Cabrit coordinatrice Pôle 2)
12h20 - 13h50	Déjeuner (Comité, observateurs, membres des labos)
	(Salle Cassini)
13h50 - 15h30	Présentations par Pôles Thématiques (deuxième partie)
	(Salle du Conseil, retransmission Grande Galerie)
13h50	40 mn Bilans LERMA Pôle 3 (F. Dulieu / LERMA)
	LPMAA Pôle 3 (C. Janssen / LPMAA)
	Projet Pôle 3 (J.H. Fillion coordinateur Pôle 3)
14h30	30 mn Bilan et Projet Pôle 4 (C. Prigent coordinatrice Pôle 4)
15h00	30 mn Bilan et Projet Pôle Services Scientifiques
	A.L. Melchior (ens.diff), F. le Petit (SO)
15h30 - 16h00	Pause
	Fin de la session plénière
	Visite des équipes
16h00 -18h00	Visite des équipes Pôles 1 et 4 en 2 sous-comités
16h00 2 h	Session Pôle 1 : Galaxies et Cosmologie
	(Salle du Conseil)
	« Tables rondes » programme détaillé en annexe

16h00	2 h	Session Pôle 4 : Instrumentation et Télédétection
		(Salle de l'Atelier, Laboratoires)
		Visite labos et « tables rondes » programme détaillé en annexe
18h00 - 18h30		Visite Salle Blanche pour les membres du Comité intéressés
		(Bâtiment B, 3e étage)
18h30 - 19h30		Huis clos
		(Salle de la Rotonde)
20h00		Dîner
		(Restaurant La Contre-Allée, 81 bd Denfert-Rochereau

Jeudi 14 février

9h00 - 11h30		Visite des équipes Pôles 2 et 3 en sous comités
9h00	2h	Session Pôle 2 : Dynamique du MIS et plasmas stellaires
		« Tables rondes » programme détaillé en annexe
		(à l'ENS 24 rue Lhomond Département de Physique Salle Conf IV)
11h10	20mn	Échange avec le directeur du Département de physique
9h00	2,5h	Session Pôle 3 Molécules dans l'Univers
		(à l'UPMC 4 place Jussieu Tour 32 2e et 3e étages
		couloir 32-33 salles à préciser)
		Dir.UFR sera présent au moins en début de visite
		manips LPMAA 3 expériences 20mn par expérience
		Visite virtuelle plateforme expérimentale Cergy
		Échanges en « tables rondes » programme détaillé en annexe
11h45 - 12h00		Visite spectromètre FTS QualAir
		(Tour 45 TBC)
12h15 - 13h30		Déjeuner (Comité, jeunes recrutés)
		(Restaurant l'Ardoise Jussieu au pied de la Tour 25)
		Fin de la visite des équipes
		Retour à l'Observatoire
		Rencontres statutaires
14h00 - 16h00		Rencontres du comité de visite avec les personnels
		(Salle Bât. B)
14h00	20mn	Post-doctorants
14h20	20mn	Doctorants

14h40	20mn	ITA
15h00	20mn	Conseils de laboratoire (sans les responsables labo / équipes)
15h20	20mn	Astronomes (services d'observation)
15h40	20mn	Enseignants-chercheurs
16h00 - 17h00	Pause - réunion avec directeurs labos & porteurs projet	
17h00 - 18h30	Réunion avec les tutelles	
18h30 - 19h30	Huis clos	

Vendredi 15 février

Évaluation et recommandations

8h30 - 11h30	Huis clos
	(Salle de la Rotonde)
11h30 ou 12h00	Courte restitution informelle
	(Salle de l'Atelier)
12h30	Option : déjeuner au restaurant de l'Observatoire
14h00 - 16h00	Option : rencontre des représentants des sections avec les
	personnels en marge de la visite

Specific points to be mentioned:

There has been no specific problem, and the visit went quite smoothly. The committee regrets however that there has not been enough time devoted to questions and discussion during the formal presentations, as most speakers considered that their presentation should last longer than the time slot allocated (including questions).

Moreover, the LERMA written document was made available late and could have been more synthetic (and checked for misprints and missing words). A significant fraction of the section in the LPMAA document describing the organization of the laboratory was written in French.

These minor problems had no significant impact on the committee work. The committee found that the visits to various sites (including the video presentation of Cergy) were well-organized and prepared, and were very instructive.

7 • Statistics by field: ST on 10/06/2013

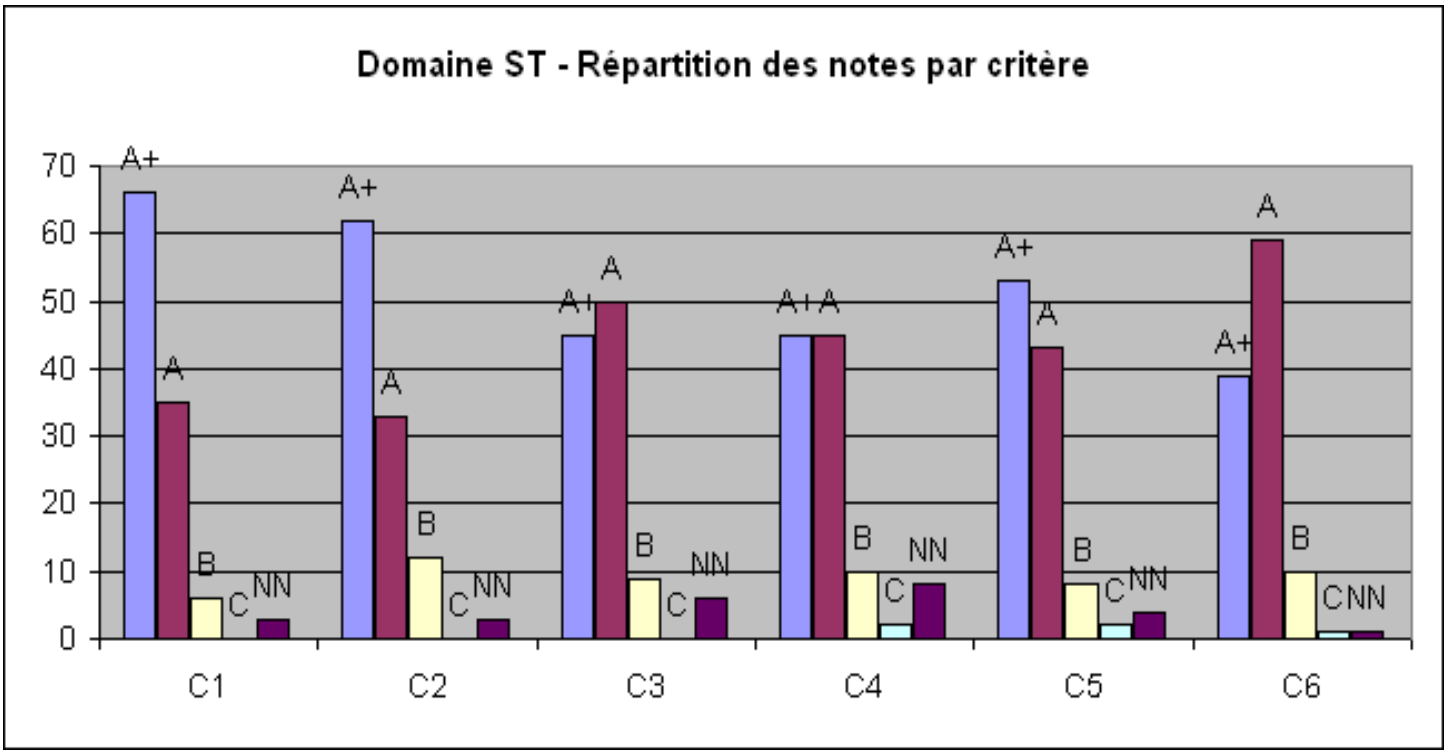
Grades

Critères	C1 Qualité scientifique et production	C2 Rayonnement et attractivité académiques	C3 Relations avec l'environnement social, économique et culturel	C4 Organisation et vie de l'entité	C5 Implication dans la formation par la recherche	C6 Stratégie et projet à cinq ans
A+	66	62	45	45	53	39
A	35	33	50	45	43	59
B	6	12	9	10	8	10
C	0	0	0	2	2	1
Non Noté	3	3	6	8	4	1

Percentages

Critères	C1 Qualité scientifique et production	C2 Rayonnement et attractivité académiques	C3 Relations avec l'environnement social, économique et culturel	C4 Organisation et vie de l'entité	C5 Implication dans la formation par la recherche	C6 Stratégie et projet à cinq ans
A+	60%	56%	41%	41%	48%	35%
A	32%	30%	45%	41%	39%	54%
B	5%	11%	8%	9%	7%	9%
C	0%	0%	0%	2%	2%	1%
Non Noté	3%	3%	5%	7%	4%	1%

Histogram



8 • Supervising bodies' general comments

l'Observatoire de Paris

Paris, le 30 avril 2013

la Présidence

PDT C.C/cb/2013-077

AERES
Monsieur Pierre Glaudes
Directeur de la Section des unités
20 rue Vivienne
75002 PARIS

Recherche
Formation
Culture scientifique

Réf. : S2PUR140007121 - LABORATOIRE D'ETUDE DU RAYONNEMENT ET DE LA MATIERE EN ASTROPHYSIQUE - 0753496T

Objet : Observations générales

Monsieur le Directeur,

Vous trouverez ci-après les observations de portée générale sur le rapport d'évaluation du LERMA.

Je vous prie de croire, Monsieur le Directeur, à l'expression de mes cordiales salutations.

Claude Catala

Président de l'Observatoire de Paris

Observatoire de Paris - 61, avenue de l'Observatoire - 75 014 Paris - France
tél : 33 (0)1 40 51 21 57 - fax : 33 (0)1 43 54 18 04 - e-mail : president.observatoire@obspm.fr
site web : http://www.obspm.fr

Laboratoire d'Etudes du Rayonnement et de la Matière en Astrophysique

Paris, le 17 avril 2013

Monsieur le Directeur
Section d'évaluation des Unités de recherche
AERES

Objet : Réponse du LERMA et du LPMAA au rapport de visite AERES
réf : D2014-EV-0753496T-S2PUR140007121-002982-RT

Monsieur le Directeur,

Nos deux laboratoires remercient la section des Unités de recherche, et plus particulièrement le Délégué scientifique en charge de l'organisation de l'évaluation du LERMA et du LPMAA, M. Michel Blanc, le Président du comité de visite, M. Jean-Marie Hameury, ainsi que l'ensemble des membres du comité et les deux observatrices qui ont accompagné le comité, de la disponibilité et de l'intérêt qu'ils ont manifestés lors de la visite. Nous saluons la qualité du travail accompli, tant lors de la préparation de la visite que pour la rédaction de l'excellent rapport qui nous a été adressé.

Nous n'avons pas de remarque majeure à faire en réponse à ce rapport, qui nous semble bien mettre en avant les forces de nos deux laboratoires et de leur projet commun, tout en relevant de façon constructive quelques aspects requérant une attention particulière de ses membres ou de ses tutelles.

Nous regrettons cependant que le transfert de l'équipe *Milieu interstellaire* du LUTh vers le LERMA² en 2014 n'ait pas été explicitement mentionné dans le rapport.. Le comité ne s'est pas prononcé sur l'ambitieux projet de plate-forme de *Modélisation du milieu interstellaire et des jets*, et n'a pas relevé le rôle international majeur joué par les membres du LERMA² dans la construction de l'Observatoire virtuel théorique. Ces 3 éléments nous semblent importants pour l'avenir du Pôle 2.

Nous pensons que la mise en application des travaux de spectroscopie du Pôle 3 à des mesures atmosphériques n'est pas une activité isolée, mais au contraire est un atout mutuellement bénéfique aux communautés de physique fondamentale et d'observation de l'atmosphère. Les collaborations suggérées, en particulier avec l'équipe atmosphérique du Pôle 4, seront naturellement renforcées avec la mise en place du nouveau laboratoire.

La diversification des applications des technologies développées par le groupe d'instrumentation est une nécessité dans un contexte programmatique distendu pour les applications astrophysiques : il est clair cependant que l'activité du groupe doit rester focalisée sur son domaine d'expertise, à savoir les dispositifs critiques, utilisant les mêmes technologies, expertise qu'il serait très coûteux de reconstruire ailleurs. Cela nécessite de continuer à développer collaborations et partenariats, car le contexte de l'emploi dans la recherche ne permettra pas de renforcer significativement cette équipe.

LERMA Unité de recherche UMR8112, du CNES, de l'Observatoire de Paris,
de l'ENS et des Universités Paris VI Pierre et Marie Curie et de Cergy-Pontoise
Direction 61, avenue de l'Observatoire 75014 Paris - France
tél 33 (0)1 40 51 22 21 fax 33 (0)1 40 51 20 02 site http://www.obspm.fr/

Le nombre de doctorants est fortement limité par le financement des thèses et l'offre de débouchés. Bien qu'il soit au LERMA² supérieur à la moyenne nationale en astrophysique, les moyens suggérés pour augmenter leur nombre nous semblent des opportunités qu'il faut en effet saisir.

Le nombre de postdocs au 30/06/2012 ayant passé au moins 12 mois dans l'unité (en l'occurrence 6) est faiblement représentatif du nombre de postdocs présents à un moment donné : ils sont 16 aujourd'hui, et tous ont un contrat d'au moins 2 ans.

Nous avons par ailleurs identifié 3 points matériels inexacts, ils sont précisés en annexe à ce courrier.

Veuillez agréer, Monsieur le Directeur, l'expression de nos salutations respectueuses,

Marie-Lise Dubernet
Directrice du LPMAA

Michel Pérault
Directeur du LERMA