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

Section des Unités de recherche

AERES report on the research unit

Laboratoire d'Astrophysique de Marseille (LAM)

From the

Aix-Marseille Provence University

January 2011

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From the

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Le Président de l'AERES

Didier Houssin

Section des unités de recherche

Le Directeur

Pierre Glorieux

January 2011

Research Unit

Name of the research unit : Laboratoire d'Astrophysique de Marseille (LAM)

Requested label : Unité Mixte de Recherche (UMR)

N° in the case of renewal: 6110

Name of the director : M. Olivier LE FEVRE

Members of the review committee

Committee chairman:

M. Pierre-Olivier LAGAGE, Laboratoire d'Astrophysique, Intrumentation-Modélisation, de Paris-Saclay

Other committee members:

M. Jean-Luc BEUZIT, Institut de Planétologie et d'Astrophysique de Grenoble

M. Olivier BIENAYME, Observatoire Astronomique de Strasbourg

M. Jarle BRINCHMANN, Leiden University, The Netherlands

M. Stéphane CHARLOT, Institut d'Astrophysique de Paris

M. Luis COLINA, Consejo Superior de Investigaciones Cientificas, Madrid, Spain

Mme. Cécile FERRARI, Laboratoire d'Astrophysique, Instrumentation-Modélisation de Paris-Saclay (CNU)

M. Jean-Pierre MICHEL, LESIA, Observatoire de Paris

M. Francesco PEPE, Observatoire de l'Université de Genève, Versoix, Suisse

M. Daniel ROUAN, LESIA, Observatoire de Paris (CNAP)

M. Giampaolo VETTOLANI, Istituto di Radioastronomia, Bologna, Italy

Observers

AERES scientific advisor :

M. Jean-Louis BOUGERET

University, School and Research Organization representatives:

M. Denis BERTIN (Vice-président du Conseil Scientifique, Université de Provence)

Mme. Fabienne CASOLI (Responsable des Programmes Etudes et Exploration de l'Univers, CNES)

M. Jean-Marie HAMEURY (Directeur Adjoint Scientifique de l'INSU)

M. Younis HERMES (Délégué Régional CNRS)

Report

1 • Introduction

- Date and execution of the visit

The committee visited the laboratory from January the 19th midday to January the 21st midday. The visit has been well prepared and organized. The first afternoon was devoted to public presentations from the director and his management team, from the 9 coordinators of a research team and from the coordinator of the CESAM data centre. The second day started with closed meetings between the committee and each of the research teams; given the numbers of teams, the committee split into three sub-committees and meetings run in parallel. Then the committee visited the brand new POLARIS and SPATIAL platforms, and a showroom where the various activities of the CESAM data centre were presented. During the afternoon of the 2nd day, the committee had closed meetings with the research staff, the technical and administrative staff, the PhD students and the post-doctoral fellows, the laboratory internal council members, and the funding authorities. All the meetings were well attended. At the beginning and at the end of the second day, one hour was devoted to internal discussions among the committee members. The morning of the third day was entirely devoted to a closed session among the committee members to debrief and to start preparing the report, except for a one-hour discussion with the management team.

- History and geographical localization of the research unit, and brief presentation of its field and scientific activities

LAM was created in 2000 from the merging of the Marseille Astrophysics Space Laboratory, and the Marseille Observatory. Until 2008, LAM staff was split over two sites. In May 2008, the whole staff jointed in a new building located in the technopole of Chateau Gombert in Marseille. LAM develops activities all along the chain of knowledge in astrophysics; indeed, LAM is involved 1) in the definition of the main astrophysical questions and of the instrumentation required to answer those questions, 2) in the development of instrumentation both for space missions and ground-based telescopes, and in the Research and Development (R&D), especially in optics, 3) in the development of data processing pipelines and 4) in the data exploitation to acquire new astrophysical knowledge. The research activity in Astrophysics at LAM concerns the cosmology and the formation and evolution of galaxies, and, to a lesser extend, the formation of stars, the study of exoplanets and Solar System objects. In instrumentation, LAM is mainly focused on instrumentation to observe the Ultra-Violet (UV), visible and near infrared cosmic radiation, with a strong expertise in optics and opto-mechanics. LAM is also strongly involved in the dissemination of the knowledge through teaching and public outreach.

- Management team

The management team is composed of the director, two deputy directors, the technical director, the administrative director and an executive assistant.

- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	27
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	21
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	19
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	75,4
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	22
N6: Number of Ph.D. students (Form 2.8 of the application file)	20
N7: Number of staff members with a HDR or a similar grade	33

2 • Overall appreciation on the research unit

- Summary

Overall, the activities carried out at LAM can be qualified as very good to excellent. In the past, LAM was mainly known from its technical achievements, especially in opto-mechanics. Nowadays, LAM is internationally recognised both for its technical realisations and its scientific production. Indeed, LAM researchers are full members of large international collaborations producing world-class results in the field of cosmology, galaxy formation and evolution, star formation, exoplanets detection and characterisation, Solar System objects studies, and have a high publication profile. They benefit from the strong instrumental investment of LAM in space missions, such as the CNES CoRoT mission, the ESA Herschel and Rosetta missions, the NASA Galex mission, as well as in ground-based projects, such as the ESO VLT-VIMOS instrument, which are producing unique data. LAM is pursuing a strong instrumental effort, being very active in developing conceptual studies in the framework of the ESA 2015-2025 Cosmic Vision program, the ESO European-Extreme Large Telescope (E-ELT) project, etc, and with a solid world-class well focused R&D program. A major event during the previous four-years period has been the grouping of the whole LAM staff into a brand new building of the Provence University at Château-Gombert; it has offered the opportunity to upgrade or develop the robotic stress polishing POLARIS platform and the SPATIAL platform to integrate and test space equipments; the moving has been conducted very smoothly thanks to a major effort from the staff and has been unanimously recognized as very positive. With these facilities, LAM has major "cards" in its hands. The creation of the CESAM data centre is also very positive, and gives another way to enter projects through participation in developing data pipelines. The recommendation from the previous visiting committee to reduce the number of teams by merging some of them has not been implemented and the present committee reiterates the recommendation. A step in that direction has been made with the organisation of a scientific activity around 2 themes: cosmology, formation and evolution of galaxies, star formation, on the one hand, formation and evolution of planetary systems, on the other hand. Theme 1 gathers a large fraction of the research staff at LAM (74%), and beyond; indeed strong links have been developed between LAM researchers in cosmology and physicists from the Marseille Particle Physics Center (CPPM) and from the Marseille Theoretical Physics Center (CPT). The theme has been well developed; a strong momentum has been given. The research made in theme 2 is also excellent, but the group (16% of the research staff) is severely understaffed. The top priority should be to re-inforce the group, especially the exoplanet part which will have to deal with a large number of guaranteed observing nights following the commissioning of the VLT-SPHERE instrument. The link with the exoplanet activity at the "Observatoire de Haute Provence" (OHP) could also be re-inforced; the proposed Pytheas "Observatoire des Sciences de l'Univers" (OSU) would offer the opportunity to develop interdisciplinary collaborations, but should not result in a decrease of the support to LAM from the staff at the OSU "Unité Mixte de Service". The relative large number of retirements, up to 14 researchers and at least 14 ITA/IATOS

over the 2010-2015 period, is both a thread (lost of know-how) and an opportunity (evolving). The number of students and postdocs present in the laboratory should be increased. LAM is a driving force in diffusing the knowledge via teaching and public outreach. LAM beneficits from a strong support from the funding authorities and has demonstrated a high capacity to raise funds (about 3 M€ in 2009).

- Strenghts and opportunities

LAM is present all along the chain of knowledge in Astrophysics (instrumentation, observing campaigns, data analysis, and interpretation). The staff number (188, including 130 permanents) and qualification are in accordance with the ambition, and LAM is installed in a brand new building. The management team is coherent and very dynamic.

Technical developments and science interests are well coupled; the broad science coverage of LAM (from solar system to cosmology) helps in that respect. LAM is well involved in the two flagship fields of Astrophysics, i.e. cosmology and exoplanets.

LAM benefits from high quality data from the CoRoT, Herschel, GALEX, SOHO space missions, as well as from the VLT-VIMOS instrument. The flow of data will further grow in the next years after the commissioning of the VLT-SPHERE instrument, the GrandTeCan EMIR spectro-imager, the 3D NTT spectrograph, the arrival at final destination of the Rosetta spacecraft : Comet 69P/Churyumov-Gerasimenko, etc...

LAM is very actively preparing the future, proposing international projects at Principal Investigator (PI) or co-PI level both for space missions or ground-based telescopes, developping conceptual instrumental studies and world-class R&D. LAM has various advantages to play a key role in the future missions to be decided: its long standing expertise in optics and opto-mechanics for UV and visible radiation, recently broadened to infrared, the Polaris and Spatial platforms, the CESAM data centre, etc…. LAM is well positioned in both the Euclid and Plato Cosmic Vision ESA projects; at least one of those will be chosen at the end of 2011 to go ahead for the implementation phase.

LAM is strongly integrated into the Provence University and is a driving force to develop teaching in Astrophysics and in Optics/Instrumentation. LAM is very active in public outreach.

LAM is well integrated in the regional, national and international networks.

There is a relatively large number of retirements in the next years, which brings the opportunity to evolve and smooth out the traces of the merging of LAS and Observatoire de Marseille which can still be recognized.

The high technical and scientific reputation of this lab might attract other groups in the country to join, which would be positive but requires special attention in building.

LAM has developed collaboration with physicists (CPPM and CPT) for the field of cosmology.

The creation of the Pytheas OSU would be an opportunity to develop interdisciplinary links, for example in the field of the Solar System objects or exoplanets.

- Weaknesses and threats

There is a large number of science teams (9), some of them with very few researchers, (down to the extreme of a team with a single full-time permanent member). Researchers are sharing their activities between two teams, which blurs the visibility of LAM from an outsider point of view.

There is a large cosmological team with a strong dynamics, which could prevent keeping a broad scientific coverage, and then weaken the strong link between instrumentation and science.

As all other laboratories involved in instrumental projects in Astrophysics, LAM suffers from the delay in decision making to select the projects that will enter in the implementation phase and from the increase number of competitive parallel assessment/definition studies.

Although LAM has invested a lot in E-ELT instrumentation, i.e. leading the phase A study of two E-ELT instruments (Eagle and Dioramas) and participating to another one (EPICS), LAM did not participate in the studies of the two instruments which have been selected to develop the first two instruments.

LAM has not yet developed a business unit for the use of the large SPATIAL platform, especially the ERIOS cryogenic vacuum chamber devoted to integration and tests of large space equipments which will be in operation in a couple of years. This has to be mitigated with the fact that LAM is participating in the assessment/definition phase of many projects, so that LAM will eventually be in charge of the integration and tests of at least one large equipment; but the risk of an under-use of the facilities exists.

The number of students and post-docs is too low; an increase in that number would further enhance the ability of LAM to react to opportunities, which is needed to remain at the front-line of quickly evolving fields.

A large number of retirements are expected in the coming years, with the risk of no complete replacement and then of loss of competences and of weakening of the strategy to be present all over the chain of knowledge. A particular attention should be paid at replace the CNAP staff retirements because of the numerous duties of LAM.

The collaboration with OHP, the other partner of the OSU untitled "Observatoire d'Astronomie de Marseille Provence", is not developed enough.

The creation of the Pytheas OSU could potentially reduce the staff available for general support/services at LAM.

- Recommendations

Strongly re-inforce the exoplanet team with several permanent positions, as the top priority.

Keep a strong link between instrumentation and science exploitation, which means keeping a broad scientific coverage, hiring both instrument scientists and thematic scientists in a well-balanced way.

Merge science teams and reduce their number, as recommended by the previous visiting committee.

Elaborate general objectives in terms of hiring of scientists, such as the relative balance between the 3 themes, between instrument scientists and thematic scientists; just compiling a long list of demands from the various teams and discuss it every year is not enough.

Increase the number of students and post-docs. Attract students for instance using non-conventional ways such as developing "summer students".

Enhance the collaboration with OHP.

Keep on being very active to increase the visibility of Astrophysics at the Licence level with the aim at increasing the number of students entering the Physics Master, (at the moment at the level of only 40 students for all the three Marseille Universities).

- Production results

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

A1: Number of permanent researchers with teaching duties (recorded in N1) who are active in research	25
A2: Number of permanent researchers without teaching duties (recorded in N2) who are active in research	21
A3: Ratio of members who are active in research among staff members [(A1 + A2)/(N1 + N2)]	0,96
A4: Number of HDR granted during the past 4 years (Form 2.10 of the application file)	3
A5: Number of PhD granted during the past 4 years (Form 2.9 of the application file)	24

3 • Specific comments

- Appreciation on the results

  – The relevance and the originality of the research, the quality and the impact of the result:

The research topics developed at LAM are all relevant topics of contemporary Astrophysics; LAM is notably active in the two most competitive and fast growing fields of astronomy, i.e. cosmology and exoplanets. For each of the topics, LAM is developing original research. LAM has kept on exploiting the VLT-VIMOS Deep Survey to study the galaxy assembly history, the Galex data to study the star formation rate history, the Soho-Lasko data to characterise the Sun coronal mass ejections; several well cited (>50 citations) publications with a LAM researcher as first author have been published. During the last 4 years period, two space missions with instrumental participation from LAM have been launched: CoRoT in 2006 and Herschel in 2009; these missions provide unique data on an unexplored part of the Universe. LAM is coordinating the CoRoT exoplanet program, which is a key position with very high international visibility; related major discoveries have been made. LAM researchers are well associated to the Herschel programs dealing with the evolution of galaxies or the formation of stars. During that period, the Rosetta-OSIRIS instrument, which LAM participated in, provided unique views of two asteroids and observed the impact of the Deep Impact NASA probe onto Comet 9P/Tempel. LAM researchers are also producing top results using facilities which LAM has not technically contributed in, as for example the HST observations of strong gravitational lensing which have allowed to further constraint the cosmological model. The evolution of galaxies is also studied at LAM though numerical simulations of the dynamical evolution of disk galaxies, which is a niche of internationally recognized expertise.

For a long time, LAM has been well known on the international scene for its research in optics and instrumentation for Astrophysics. LAM has continued to develop instrumental concepts and has led the studies for the assessment or definition phase of several instruments: EAGLE and DIORAMAS for the European Extremely Large Telescope (E-ELT), the ASPIICS coronograph in the framework of the ESA Proba3 program, etc. Several world-class R&D programs in optics have been conducted, such as developing the stress polishing techniques to make complicated aspherical optical elements, which allow to simplify optical designs and then to increase the performances for both ground and space based instrument.

  – The quality and the number of the publications, scientific communications, thesis and other outputs

From 2006 to 2009, 787 refereed papers were published. The total number of citation for these papers is 16600. 37 papers have more than 100 citations; 87 have a number of citations between 50 and 100. Among these papers, 11 were published in Nature and 7 in Science. There is a continuous increase of the number of papers produced, from 123 per year in the 2004-2006 period to 258 per year in the 2008-2010 period. 550 papers were published in conference proceedings. 24 PhD theses were passed.

It should also be pointed out that numerous technical and managerial reports have been issued in the framework of the reviews monitoring the development of international instrumental projects.

  – The quality and the stability of partnerships

LAM is working within large international consortia, either on large scientific programs or large instrumental projects. The projects/programs are selected on a competitive basis, which is a way to ensure quality. The projects/programs are related to stable organisations such as ESO or ESA in Europe or NASA in the US, etc.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

  – The number and the reputation of the awards obtained by staff members, including invitations to international conferences and symposia

A LAM researcher has got the Deslandres awards from the French Academy of Sciences and another one has got a special award from the Greek Academy of Science. One professor is member of the “Institut Universitaire de France”. One researcher has got an advanced European Research Grant. Seven researchers are leading or have been leading an ANR project. The phase A study of two E-ELT instruments and one ESA instrument (ASPIICS) were led by a

LAM scientist. Several researchers are members of international telescope time allocation committees. Researchers are regularly invited to give a review talk in international conferences.

– The ability to recruit high levels scientists, post-docs and students, and more particularly from abroad

In the 2006-2010 period, 10 permanent positions were attributed to LAM; three were funded by the Marseille University, 5 by CNRS and two by CNAP. Two of the three assistant professors are foreigners. 24 PhD students have defended their theses. 13 post-docs, most of them foreigners, joined LAM.

– The ability to raise funds, to successfully apply for competitive funding, and to participate to scientific and industrial clusters

The consolidated budget of LAM was of 13,4 M€ in 2009. The remaining budget after removal of the permanent staff salaries is of the order of 4 M€. Out of these 4 M€, about 3M€ have been obtained through competitive calls for funding at the regional level, national level (ANR, INSU, CNES) and European level (FP7, ESA, ESO).

LAM is part of the "Groupement d'Intérêt Scientifique" (GIS) PHASE (Obs Paris, ONERA, IPAG, LAM) for High Angular Resolution Instrumentation and of the GIS "Photonique et instrumentation Avancée" (Fresnel, LP3, LAM). LAM is also associated to the Optitec/POPSud Competitiveness Cluster. LAM has developed links with physicists; the OCEVU proposal of a "LAboratoire d'EXcellence" (LABEX) including both physicists from CPPM and CPT and LAM astrophysicists has been submitted.

– The participation to international or national scientific networks, existence of stable collaborations with foreign partners

LAM researchers are fully integrated in international networks. The publications show that they have collaborators in more than 90 laboratories all over the world. LAM has been at the initiative of a European network untitled "Exploring the dawn of the Universe with gamma ray burst".

– The concrete results of the research activity and socio-economic partnerships.

LAM is a fundamental research laboratory and the concrete results of the research activity are, first of all, scientific publications (see section about the publications). Astrophysics is an observational science, which requires large ground-based telescopes or space missions equipped with innovative instrumentation. LAM is building such instrumentation and one of the technical achievements during the last 4 years period has been the building of the VLT-SPHERE IRDIS instrument. The instruments have to be tested and LAM has developed the platform SPATIAL which can be use by companies. LAM has developed another platform, the POLARIS platform, in partnership with the SESO optics company. LAM has got a contract from ESO to develop with this facility a prototype of a mirror segment for the E-ELT. Two patents have been taken, one with the SESO company about manufacturing aspherical optical surfaces, the other one with the Thales Alenia Space group about MOEMS. LAM engineers have spin off a start up named "First Light Imaging".

- Appreciation on the management and life of the research unit

– The relevance of the research unit organization, quality of the management and of the communication policy

The unit is organized in 9 scientific teams, the CESAM data centre, 6 technical teams organized according to technical skills (mechanics, optics, electronics, project support, assembly, integration and tests, and logistics) under the supervision of the technical director, and an administrative team. Technical staff members from different technical teams are appointed to one or several projects, so that the organisation follows a matrix organisation connecting skills and projects. Such an organisation is globally relevant and is used in many astrophysics laboratories as well as private companies. There are a few shortcomings in the organisation of the science teams; thematics are overlapping; technical staff members are present in some scientific teams. The management team is made of the director, two deputy directors, the technical director, the administrative director and an executive assistant. The management team meets regularly.

The discussions with students and postdocs did not rise any major issue.

During the meeting with the technical and administrative staff, a question about R&D visibility and evaluation popped up. Indeed R&D activities are not only developed in the LOOM team. The R&D activities of other teams appear in the report, but concerns were raised that these activities, which are not part of a research team, have not been visible enough during the visit of the Committee. The concern should be digged out by the management team. Note that the Committee did not hear complains about the lack of promotion and indeed the rate of promotions for both ITA and IATOS is good.

The discussion with the research staff has shown that the staff was supporting the organisation in numerous scientific teams; one of the reasons is that each team leader has a seat in the scientific council where the scientific priorities in terms of permanent positions, PhD students, etc, are discussed.

During the discussion with the laboratory internal council members, some members expressed the opinion that the council has little influence on the decisions taken by the executive and complained about the fact that some important issues, such as the participation of LAM in the LABEX OCEVU proposal, were barely discussed.

Note that everybody underlined the strong positive impact of the moving of the whole staff to a new building.

– The relevance of the initiatives aiming at the scientific animation and at the emergence of cutting edge projects

Science animation is made within research teams (especially the cosmology team) and, at the level of the laboratory, according to 2 themes: cosmology, formation and evolution of galaxies, star formation, on the one hand, formation and evolution of planetary system on the other hand.

An international conference gathering more that 200 astrophysicists and cosmologists is organized by LAM every two years. Following LAM initiatives, two very large international conferences took place in Marseille: the SPIE Astronomical Instrumentation conference in 2008 (2000 participants), and the conference untitled "Towards the European Extremely Large Telescope" in 2006 (600 participants).

– The contribution of the research unit staff members to teaching and to the structuration of the research at the local level

LAM is very actively participating in the teaching at the Provence University, with about 2000 teaching hours a year. LAM coordinates all the teaching activity related to Astrophysics. At the PhD level, about 6-7 PhD are awarded every year. At the Master level, the teaching of Astrophysics has been broadened in the "Physics and Matter sciences" Master; an option "cosmology and astroparticle" has been introduced in the second year of the Master. Two new Masters have been created with LAM being a partner: "Optics, Instrumentation and Lasers" and "Europhotonics", an Erasmus Mundus Master. The broadening of the teaching of Astrophysics at the Licence level in order to attract more students in Science has been proposed but not accepted (yet). LAM has also been very active structuring the research at the local level, for example with the proposal of a LABEX with physicists at CPPM and CPT, with the participation in the discussions to create the Pytheas OSU, with being part of the GIS "Photonique et instrumentation Avancée" in partnership with the Fresnel institute and the LP3 ("Lasers, Plasmas et Procédés Photoniques") laboratory…

- Appreciation on the scientific strategy and the project

– The existence, relevance and feasability of a long term (4 years) scientific project

The scientific project is, for a large part, a continuation of the previous project; this is normal given the long time scale of space projects or large ground-based projects. The VLT-SPHERE instrument, for which LAM has developed a major subsystem: the Infra Red Differential Imaging Spectrograph (IRDIS), will enter in operation and provide unique data to detect and study exoplanets. The exoplanet team at LAM cannot fulfil his share in the scientific exploitation of this instrument without additional support in terms of permanent and non-permanent positions. For several scientific fields, LAM intends to use ALMA; this is perfectly relevant, but requests the hiring of a specialist of such observations. The project relies on a constant level of permanent staff, which looks reasonable.

– The existence and relevance of a policy for the allocation of resources

The allocation of technical resources is well organized. When technical support is requested for a project, the lead of the project makes the request to the technical director, who discusses with the technical team coordinators;

if choices are needed, they are made at the LAM director board level. During the next 4 years period, several projects will eventually be accepted and will enter the implementation phase.

These projects will not be all accepted at the same time and a danger, well outlined by the LAM management team, would be to attribute the technical resources on "a first come, first serve" basis. A recruitment plan of 4/5 persons per year for technical staff is identified.

There is an strong peak of retirement in 2012. It is a high priority to preserve the existing know-how.

Scientific resources (PhD, permanent positions) are discussed within the science internal council. A list of the permanent research positions requested from the various science teams has been established. The number of positions is higher than the number of retirements. The list is discussed on a yearly basis by the scientific council and priorities are made, which is fine. However, general objectives in terms of the relative balance between the 3 main themes (cosmology/galaxy formation and evolution, exoplanets/Solar System, optics/instrumentation), as welle as between instrument scientists and thematic scientists … should rather be defined for the next 4-5 years.

– The originality and existence of cutting edge projects

Most of the LAM projects are large international projects, selected after a very competitive process, which guarantees that the projects are original and cutting edge. The same is true for the instrumental projects, which are accepted only after long years of assessment and definition studies; several projects being studied in parallel and in competition.

4 • Appreciation team by team

Out of the 9 scientific teams, the experts have decided to report on only 8 of them. Indeed one team, the so-called Exogen team, is made of a single permanent member working at 100% in the team and of two members spending 25% of their time or less in the team. This is why, the committee considered that evaluating the team would be very close to an individual evaluation and we decided not to report on the team. Note that this team was created in June 2009. Setting up such a small team was not justified on scientific grounds.

- Title of the team : Cosmology
- Team leader: M. Jean-Paul KNEIB
- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	7,5
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	7
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	5,5
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	0
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	0
N6: Number of Ph.D. students (Form 2.8 of the application file)	4
N7: Number of staff members with a HDR or a similar grade	7

- Appreciation on the results

The cosmology group is LAMs largest research group with 13 researchers and a further 3 associated at a 50% level. The group has a broad scientific interest and a high international visibility and carries out world-class instrument development and science.

The main threads of research have been galaxy lensing, particularly strong lensing, and statistical studies of the galaxy population building on massive spectroscopic surveys. In both these areas the cosmology group has proven its ability to carry out world-class research.

Their work is generally done as part of large collaborations and the impact of the research is generally high to very high. 295 referred papers were published during 2006-2009; 394, when including year 2010. A significant number of papers (24) were cited more than 100 times; 4 papers were published in Science or Nature, one of which with a first author affiliated to LAM. Ten PhD students, (including 4 in co-supervision; 1 with CPPM, 2 with ESO, 1 with China), have passed their thesis during 2006-2009.

The cosmology group has world-class expertise within several fields. They use this to lead large, high-impact surveys, such as the VVDS and it also means they are regularly invited to join large survey efforts around the world. Through these collaborations they have established a large and fairly stable network of collaborations, particularly within Europe.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The cosmology group's work has clearly high impact and this is reflected in a high rate of success at obtaining ANR grants (5; 2 as PI and 3 as co-I), as well as the recent award of a prestigious ERC Advanced Grant to a member of the group. The quality of the group has allowed them to attract high quality young researchers to permanent positions (5), as well as good students and post-docs.

The research within the cosmology group clearly benefits greatly from the wide-ranging international collaborations and large projects the group is involved in. They are involved in a number of the highest profile international projects (e.g. VVDS, COSMOS, zCOSMOS, SNLS, BOSS, etc). This clearly offers a range of opportunities for the group but it is also challenging to achieve high visibility both for the lab and for individuals. The group is regularly invited to international conferences and also organizes a very high profile series of cosmology conferences in Marseille every two years. As a result the group has good international reputation, with some individuals having particularly high international visibility.

- Appreciation on the scientific strategy and the project

The team has identified a number of areas where they plan to make major efforts in the coming years. This continues their work on galaxy properties, which could be considered incremental in nature but is of significant scientific interest. In addition they aim to extend their work on the properties of virialized structures which overall has a high degree of originality and where the group is very well placed to make significant progress. The group also wants to continue its work on high-z galaxies where they are among the world-leaders, as well as strengthen their involvement in obtaining constraints on cosmological world-models. All of these topics are at the forefront of research globally and the cosmology group at LAM is well placed to make significant contributions to all these fields.

The strategy for obtaining resources is reasonable. The current plan is to enter into a range of projects. Particular care should be taken that this does not cause the group to lose scientific focus.

- Conclusion :

  – Summary

The cosmology group at LAM is of very high quality and has world-leading expertise in its core areas which enables them to enter into the main international projects on an equal footing to other teams. The massive surveys that the group are involved in require work-intensive aspects of data reduction which are not immediately rewarded by publications. This overall situation could be improved with a more aggressive policy of recruiting post-docs. This

would also help the group's ability to rapidly respond to new opportunities that require rapid turn-around for research. This latter aspect is particularly true for the competitive fields of high-z galaxies and dark energy studies.

– Strengths and opportunities

The main strength of the LAM cosmology group is its ability to be involved in all stages of a survey from the conception of novel instrumentation, through the data reduction and analysis, to the production of scientific results. This sets this group apart from the majority of its competitors and should be maintained.

The broad range of expertise and recent hiring of excellent young researchers offer a great opportunity for the cosmology group to carry out high impact research in the coming years. The strategic positioning of the group has been exemplary and they are well placed to improve their already high international standing.

– Weaknesses and threats

The group plans to continue to be involved in a wide range of collaborations. If not carefully managed, this could potentially lead to a lack of scientific focus. The group has a relatively small number of post-docs and PhD students compared to some of their competitors, which could lower the impact of the team, particularly within the intensely competitive field of dark energy projects.

– Recommendations

The group is well placed to make a significant impact in a range of important fields. To ensure that a high publication rate is maintained, we recommend an increase in the number of post-docs and students.

- Title of the team : Physics of Galaxies
- Team leader : M. A. BOSELLI
- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	5
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	4
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	2
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	3
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	
N6: Number of Ph.D. students (Form 2.8 of the application file)	4
N7: Number of staff members with a HDR or a similar grade	8

- Appreciation on the results

The physics of galaxies group is the LAMs 2nd largest research group with 9 permanent researchers. The team studies the nature of galaxies through the analysis of their physical properties (star forming regions, interstellar medium, kinematics, and dynamics) at different epochs with the final aim at constraining galaxy evolution.

The study is done using a multi-wavelength approach, and in particular thanks to unique data sets from the NASA GALEX space mission in the Ultra-Violet cosmic radiation and from the ESA HERSCHEL space mission in the Far-Infra-Red cosmic radiation.

The rate of publication is good, with 116 refereed papers published during 2006-2009. When including the publications of 2010, which takes into account the first Herschel publications, the rate of publications increases to 179 refereed publications, which is very good. The quality of the publications is good to excellent, with several papers with more than 100 citations and 4 papers published in Nature or Science. Only one PhD has passed his thesis during 2006-2009; three when taking into account year 2010.

The team has stable partnerships in large international projects, such as GALEX and HERSCHEL.

The team has an important involvement in developing new instruments, leading the development of the OCAM camera, (the fastest high precision faint object camera ever built for Astrophysics), and of the 3D-NTT visible integral field spectro-imager.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

Members of the team are regularly invited to give a talk in international conferences (22 during 2006-2009). An engineer of the team has received the award "Engineer of the year for science 2009" by the "Conseil National des Ingénieurs et Scientifiques de France" (CNISF) et l'Usine Nouvelle for the development of the OCAM camera.

The capacity to raise funds is good, both at the national level (e.g. participating in 4 ANR grants), and at the international level (EC-FP6&FP7 for the instrumental aspect…). Important transfers of technology to industrial partners (SESO & spinoff company "First Light Imaging") have been made.

- Appreciation on the scientific strategy and the project

The team will continue the multi-wavelength studies of the nature of galaxies. In addition to data from Herschel, GALEX…, the group will benefit from data obtained with the large field-of-view 3D-NTT instrument (tunable Fabry-Perot spectrograph), which will soon become operational. Due to retirements, an absence of recruitments would make the group size significantly shrinking in the coming years (-3), possibly not reaching the critical mass to develop all the projects.

- Conclusion :

  – Summary

The team is developping multi-wavelength studies of galaxies in the framework of international collaborations using most advanced facilities, such as Herschel and Galex. The visibility of the team is good to very good, but could be further enhanced, for example thanks to an increase in the number of post-docs, which is too low. The instrumental part of the team is excellent with cutting-edge developments. The team has established solid collaborations at national and international level.

  – Strengths and opportunities

- The group has developped a multi-wavelengths expertise to study galaxies.
- The group participates in large international projects and plays an important/major role in the projects.
- The group has the possibility to build and use visitor instruments, such as the 3D-NTT instrument.
- The group is leading the development of cutting edge instruments.
- The valorisation of the technical developments is excellent.

  – Weaknesses and threats

- The number of postdocs (1) is much too small.
- There has been no new permanent position attributed to the team during 2006-2010.

- Several members of the team will retire in the next years.
- The technical developments are only partly related to the science developed in the team

– Recommendations

- The number of post-docs and students has to be increased.
- The hiring of young researchers is needed.
- The committee does not recommend to hire new engineers directly in science teams; all new engineers/technicians should be either in the technical division, so that priorities between projects are done at the laboratory level, or at LOOM to guarantee a minimum R&D activity.

- Title of the team : Stellar population and galaxy evolution (PSEG)
- Team leader: M. José DONAS
- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	0,5
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	3
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	3
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	1
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	0
N6: Number of Ph.D. students (Form 2.8 of the application file)	2
N7: Number of staff members with a HDR or a similar grade	3

Note that a student has started a thesis in october 2010; he is sharing his time between this team and the cosmology team.

- Appreciation on the results

PSEG is a small sized group within LAM with two full-time researchers and four researchers that are associated at a 50% level (including an emeritus).

Over the past period, the PSEG research emphasis has been on exploiting data from the GALEX satellite and the FIREBALL balloon experiment. These facilities offer a unique view of the Universe in the UV and have been constructed with essential contributions from LAM and PSEG in particular. The strong involvement of the group in the construction of GALEX has also enabled privileged access to GALEX data, which the group has efficiently used to exploit the related science.

As a consequence the group has a clear scientific focus, high reputation and maintains an international forefront position in building UV instrumentation, as testified by its involvement in international collaborations.

The publication output of this group is very good and of very high international standing; 112 referred papers were published during 2006-2009; 141, when including year 2010. This result is part from a long-term collaboration with the Caltech group, which has also enabled the group to maintain its position at the forefront of UV

instrumentation development, despite the small number of local researchers involved. No PhD student has passed a thesis during 2006-2009; two students are preparing a PhD.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The PSEG team is involved in projects of high visibility leading to high-impact research results. ANR support (1 ANR as PI) and the successful funding of a number of post-docs associated to these projects have helped the team maintain good visibility both nationally and internationally.

The group has maintained fruitful international collaborations as well as internal collaborations with the instrumentation team. National collaborations have been significantly strengthened by the BINGO project funded by ANR. This has also broadened the range of expertise and strengthened the scientific work of the group.

- Appreciation on the scientific strategy and the project

The team has identified the evolution of baryons as their continued focus of research. This includes a strand on tracing the evolution of galaxies using massive spectroscopic surveys and another branch tracing the inter-galactic gas. This area will see significant activity in the coming years with a number of projects planned worldwide. The team is well placed to carry out high impact science here. In particular the proposed balloon-borne (FIREBALL2) and space-based (ISTOS) missions will offer the team a significant competitive edge.

The strategy would have to be changed if none of these proposed missions were accepted. There is no fully detailed backup plan on how this would be accomplished. Another challenge for the team is to ensure that their scientific level is retained despite the foreseen retirements.

The strategy for obtaining resources is not fully worked out, but for the moment it is reasonable. Should FIREBALL2 and/or ISTOS be funded, the group should have no difficulty hiring the required PhD students and post-docs.

- Conclusion

  – Summary

The PSEG group at LAM has high scientific quality and world-class expertise in UV astronomy --- with a large contribution to the GALEX satellite and the FIREBALL balloon experiment --- as well as in the analysis of spectroscopic galaxy surveys. This has enabled the group to remain associated to unique, forefront world-class projects. Pursuing this strategy should warrant a bright scientific future, especially if good replacements can be found for retiring personnel to maintain the expertise in the core activity of UV astronomy.

The main challenges for the group is to minimize risk with respect to future projects not yet funded and to respond to loss of expertise through upcoming retirements.

  – Strengths and opportunities

The main strength of PSEG is its strong link to instrumentation and ability to participate in missions from conception of novel ideas through to exploitation of the data from these facilities. That this can be maintained within a small group is commendable.

  – Weaknesses and threats

A key challenge for PSEG is to respond to upcoming retirements that will impact on the size of the group as well as potentially loss of expertise. Since the future scientific program relies significantly on two missions FIREBALL2 and ISTOS, it is clear that failure to fund these missions is a significant threat.

– Recommendations

The group should design a strategy to minimize the impact of future retirements on the planned science accomplishments. The group has made commendable effort to build new collaborations and is encouraged to continue this effort. This could also help offset problems caused should neither FIREBALL2 nor ISTOS be funded in the future.

- Title of the team: Dynamics of galaxies
- Team leader: M. A. BOSMA
- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	1
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	2
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	2
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	1
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	
N6: Number of Ph.D. students (Form 2.8 of the application file)	2
N7: Number of staff members with a HDR or a similar grade	2

- Appreciation on the results

The dynamics of galaxies team is a small sized group within LAM with only 3 permanent researchers. The team is conducting original researches on dynamics of galaxies combining numerical simulations, chaos theory and nature of dark matter. The team occupies a position of leader in its field on the international scene; 37 referred papers were published during 2006-2009; 44 when including year 2010. The papers have a relative small median value of number of co-authors (4), so that the number of papers normalized by the number of authors is on the high side. The team has been very successful in attracting PhD students; 4 theses with tutoring or co-tutoring from team members have been passed during 2006-2009.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

One member of the team has got a special award from the Greek Academy of Science.

A young researcher has been recruited by the CNRS to work in the team. Several postdocs and PhD students, most of them foreigners, have worked in the team.

The team has managed to raise the funds needed for its research (computing equipment, travel…), at the university level (“Plans pluri-formations”), at the national level (ANR (PI), CNES, National programs).

The team is well known internationally in the field of dynamics of galaxies.

- Appreciation on the scientific strategy and the project

The project is in continuation with the previous project. The part which consists in comparing models and observations is growing, as the team is involved in several large observational programs with Spitzer in the infrared, with MeerKAT in the radio… Such a trend is endorsed by the Committee.

- Conclusion :

  – Summary :

The team is internationally well recognized and the scientific output is excellent. Two of the three members of the team will retire, which will be a major lost of expertise.

  – Strengths and opportunities :

The group is well visible of their scientific activities.

Combination of numerical simulation and particle physics expertise.

The team has an excellent capability to attract students.

  – Weaknesses and threats :

Two out of the three permanent members will retire in the next years, leading to the loss of a large part of the expertise.

  – Recommendations

Seek collaborations with other LAM scientists working on related aspects (2D kinematics of nearby galaxies with Fabry-Perots, 3D-NTT, kinematics of high-z galaxies…).

Increase the visibility of the studies about the nature of the dark matter within the team and at LAM level.

Participate in discussions at the laboratory level and with the Physics of Galaxies and the Cosmology teams to determine how to keep expertise given the retirements.

- Title of the team : Interstellar Medium and star formation
- Team leader: A. ZAVAGNO
- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	5.5
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	3
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	0
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	3
N6: Number of Ph.D. students (Form 2.8 of the application file)	0
N7: Number of staff members with a HDR or a similar grade	5

- Appreciation on the results

The group is a small sized group, with 5 permanent members (with teaching or service duties) and an additional member sharing her time between the team and another team. The researchers of the group are interested in the interstellar medium and in star formation. The research is in the main stream with a niche of excellence: the detection of massive star formation triggered by HII regions. The research of a member is focused on history of astronomy.

Members of the group have been deeply involved in the preparation of the Herschel space mission over the past years and are now dedicated to the exploitation of several Guaranteed Time & Open Time Herschel projects, as PIs or CoIs. Herschel is really THE mission to study star formation and the choice to invest strongly in this mission was the right one.

The number (20) of referred papers published during 2006-2009 is reasonable given the size of the group and the time spent in teaching or preparing Herschel. When taking into account year 2010, the number of referred papers increases significantly to 70, which is very good; this is mostly due to the publications of the first Herschel results.

The number of PhD thesis presented over the last four years is too low.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

Herschel is being revolutionizing the view of star formation and the team at LAM takes its share.

The group has difficulties in attracting PhD students; no PhD students at the moment in the group, when unique Herschel data are there. Two post-docs are working in the group on Herschel data; both are foreigners (US and Argentina). No new permanent researcher has been attributed to the team during 2006-2010.

- Appreciation on the scientific strategy and the project

The team will continue exploiting Herschel data, which is fine. The next step in that field is Herschel follow-up observations with ALMA, and the team indeed plan to use the facility. But, the group will not benefit from Alma Guaranteed Time observations, as it was the case for Herschel. Given that the field is evolving very rapidly, that there will be several retirement in the group, the group would play a more and more marginal role, if no permanent and non permanent researchers would re-inforce the team.

- Conclusion :

  - Summary

The group is heavily involved with Herschel and is leading several proposals. However the group is undersized to have a strong impact and get the visibility according to the level of involvement in Herschel programs. The situation will be soon even worse given the retirements to come.

  - Strengths and opportunities

Members of the team are leading the scientific exploitation of Herschel in certain research areas, in particular star formation in HII regions.

ALMA opens the opportunity to further develop the field of research.

  - Weaknesses and threats

Given the scheduled retirements, the team will be reduced to 2 permanents (with teaching duties), plus one permanent (with service duties) working only ½ of her time in the team.

The team has difficulties attracting young researchers (permanent, students).

  - Recommendations

Seek active collaboration with other LAM scientists.

Increase the number of PhD students, for example attracting them from other countries involved in the Herschel projects.

Focus on the Star formation triggered by HII regions project.

- Title of the team : Exoplanets, Stellar Atmosphere and interactions
- Team Leader: M. M. DELEUIL
- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	1,5
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	2
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	2
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	
N6: Number of Ph.D. students (Form 2.8 of the application file)	3
N7: Number of staff members with a HDR or a similar grade	4

- Appreciation on the results

The group is a small sized group, with 3 permanent members and an additional member sharing her time between the team and another team; a fourth permanent member is on temporary leave in the USA. The team is leading the extrasolar planet program of CoRoT, which is the first mission detecting transits from space: this is a very unique position. In addition, the group has the ability to combine transit and radial velocity measurement, especially by using the SOPHIE instrument at OHP.

The results have a very important impact at an international level: for instance the discovery of the first rocky planet, corot7b, or of a true orbiting brown dwarf, corot-13b; many press releases, and invitations in congress testify of this importance.

The quality and the number of publications are at a very good level; 115 refereed papers were published during 2006-2010. The number of thesis is very good given the small size of the team.

The partnership is both national and international and of high quality (e.g. Geneva Observatory is the world leader in terms of exoplanets discovered by radial velocities) and made solid through consortia conducting space experiments (PLATO, CoRoT) with clear commitments on the long term.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The group participates to international conference and is invited to give talks, but in addition organizes the regular meeting of the Corot Exoplanet Science Team and will be in charge of the next CoRoT Symposium that will gather more than 200 people.

There is a potential for attracting scientists of high level, but it has not yet been concretized beyond the levels of post-docs. Concerning post-docs, their number and diversity of origin is fully satisfying.

The ability to raise funds is not a pertinent criterion for the considered period since a unique project (CoRoT) monopolizes the energy of the group; however one notes participation to ANR proposals and to the phase A study of a space project (PLATO), as well as the capability to raise funds for site missions and functioning.

The group participates actively to the CoRoT international consortium (leadership of the exoplanet program) and to the consortium Sophie of exoplanet follow-up.

In terms of outreach, the group has a good impact with the production of movies, expositions and press releases.

- Appreciation on the scientific strategy and the project

The long-term plan is clear and essentially based on the continuation of the CoRoT activity and on the participation to the two international projects PLATO and SPHERE.

Resources have been actively requested to the laboratory in case where PLATO would be selected.

There is no doubt that both PLATO and SPHERE are cutting edge projects that will be at the forefront of the competition in the field of exoplanet studies.

- Conclusion :

The group is a very active group that produces numerous and very good results. The group has many international collaborations and a clear plan for the future based on cutting-edge projects to come. The small size of the group is its main weakness, even if one notes very positively the fair number of PhD and post-docs.

– Strengths and opportunities

The strength of the group is to be well positioned between the two most productive techniques in the field of exoplanet research; they also have developed specific tools such as the alarm mode and exploitation of light curves; the youth and the good spirit of the group are also good assets.

– Weaknesses and threats

Two members have left the team.

The group is sub-critical in size, the threat being even larger if PLATO is selected.

– Recommendations

Follow on the same line, but recruiting and/or attracting scientists is mandatory.

- Title of the team: Solar System
- Team Leader: M. P. LAMY
- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	2.6
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	1
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	1
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	5
N6: Number of Ph.D. students (Form 2.8 of the application file)	4
N7: Number of staff members with a HDR or a similar grade	1

- Appreciation on the results

The Solar System team is a small sized group within the LAM (1 permanent fully devoted to research; 2 researchers with duties, plus an additional one on temporary leave from Observatoire de Paris). The team develops its research activities along two main topics, understanding the physics of the solar corona on the one hand, and the formation and evolution of the Solar System through the study of small bodies on the other hand. Its high reputation in these fields relies on the construction of space instruments, such as LASCO/C2 on board of the SOHO mission and OSIRIS/NAC on board of the ROSETTA mission, and their operational and scientific exploitation.

This privileged position and implication in space instrumentation directly impacts the quality of the scientific outputs with numerous discoveries and prime results, such as the detection and characterization of coronal mass ejections and their 3D reconstruction or the physical characteristics and surface properties of the asteroid Stein, targeted by the Rosetta spacecraft. The publication rate is very good and at the very high international level. 150 papers were published in refereed journals, 35 of them with a team member as first authors; 5 publications in Science, one in Nature.

Partnership with the international agencies ESA and NASA is solid due to the success of these realizations.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The recognized expertise of the team induces numerous solicitations to contribute to the R&D of solar coronagraphs like SO/METIS, HI-Rise or Proba3/ASPIICS through international collaborations. The funding and grants come along through the national space agency CNES.

This team has remained attractive for PhD students and post-docs since many years. A young researcher has been hired by the CNAP to join the team; a young assistant professor from the Paris Observatory has been detached to LAM to work with the team; both are studying small bodies in the solar system.

The projects happen at the international scale and imply solid and long-term partnership with numerous foreign institutions.

- Appreciation on the scientific strategy and the project

The funding and the scientific project are well settled for the next 4 years with the instrumental development or scientific analysis of SOHO, STEREO, ROSETTA, ASPIICS, and EPOXI/Stardust missions. The resources for non-permanent positions for the analysis of coronal data and Rosetta data are secured. Post-doctoral and permanent positions plans are proposed. Instrumental projects for the study of small bodies in the Solar System are also proposed, in particular an original thermal infrared spectro-imager. A well-foreseen challenge for the team is the recruitment of a senior scientist to insure continuity in expertise despite retirements.

- Conclusion :

– Summary

The group has a prominent position at the international level on the construction and exploitation of solar coronagraphs or imager for in-situ exploration of small bodies in the Solar System. This small-sized group has strong international bonds and high scientific recognition.

– Strengths and opportunities

The well-known expertise in space instrumentation of the team is a definitive asset for further implications in future space projects in solar coronagraphy and in-situ exploration of small bodies. The team is very active seeking for participation in the next space missions.

Researchers are well embedded in their scientific community at the international level.

The Rosetta mission will arrive at final destination and bring unique data about comet Comet 69P/Churyumov-Gerasimenko.

– Weaknesses and threats

The main threat resides in the forthcoming retirement of the team leader that will severely impact this small-sized group in its mid-term evolution, attractiveness and expertise.

None of the future participations in a space mission is definitely secured.

– Recommendations

Focus on the science objectives concerning the small bodies in the Solar System. Young researchers should pass their HDR grade to insure the continuity in the formation of PhD students.

- Title of the team : LOOM – Laboratoire d'Optique de l'Observatoire Marseille
- Team leader : M. FERRARI
- Staff members

N1: Number of researchers with teaching duties (Form 2.1 of the application file)	3
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	2
N3: Number of other researchers including postdoctoral fellows (Forms 2.2, 2.4 and 2.7 of the application file)	
N4: Number of engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	6
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	2
N6: Number of Ph.D. students (Form 2.8 of the application file)	
N7: Number of staff members with a HDR or a similar grade	1

- Appreciation on the results

Loom is a relatively small sized group within LAM, with only five permanent researchers. The team is actively developing world-class research and development programs in optics and instrumentation. The team is one of the very few worldwide leaders in active optics methods, i.e. stress polishing for instance, to develop complex aspherical optics with excellent surface quality. Such optical components are critical to optimize the concepts of both ground and space-based instruments, especially by reducing the number of optical surfaces and therefore increasing throughput and wavefront error budgets. This is critical in particular for instruments dedicated to high contrast imaging such as SPHERE for the VLT, but also to obtain thin shells for deformable secondary mirrors.

LOOM is involved in the design, prototyping and characterisation of MOEMS devices for space applications, such as programmable slits or gratings for multi-object spectrographs. This know-how is also internationally recognised.

In the past years, LOOM has also begun to work on adaptive optics simulations and control systems, for either wide field-of-view adaptive optics systems (correction of the ground layer) or high contrast systems (large number of degrees of freedom).

The rate of publications in 2006-2010 (18 refereed publications, 35 SPIE publications with a 1st author from LOOM and more than 100 papers within projects and collaborations) is very good for an instrumental team. Two patents have been published.

The number of PhD students is excellent: 6 students have obtained their thesis between 2006 and 2010, and 5 more students are currently preparing a PhD thesis. One post-doc is part of the team.

The team has developed partnerships with large companies such as SESO, SAGEM-REOSC, Thales Alenia Space; it is also working under contracts with ESO and ESA.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The team has been very successful in attracting young scientists. Indeed one assistant professor hired by the Provence University has joined the team, as well as one young researcher hired by CNRS. The team is also very successful to attract PhD students.

LOOM has a high profile in the ability of raising funds. Significant funding has in particular been obtained in the framework of the FP7 OPTICON program, but also throughout direct contracts with ESO, ESA, CNES, and the French OSEO/FUI agency. For example, LOOM has got a contract with ESO to develop a mirror segment for the E-ELT. LOOM is well connected to national networks, such as the GIS Phase for High Angular Resolution instrumentation. Each of the two patents has been published with an industrial partner. The team is well integrated in the OPTITEC Competitiveness Cluster.

- Appreciation on the scientific strategy and the project

The strategy to keep on developing active optics for both ground and space-based applications, to enhance the participation on high angular resolution instrumentation in the framework of the E-ELT and to keep on working on micro-optical systems is fully relevant and feasible. LOOM contributions in these fields are at the cutting edge. Moreover LOOM is ensuring that these R&D activities remain closely linked to the scientific priorities of LAM.

- Conclusion :

– Summary

LOOM is an excellent team, conducting world-class R&D activities and with unique expertise in some of their fields of research.

– Strengths and opportunities

LOOM is very attractive to young researchers.

With the POLARIS platform, LOOM benefits from a unique facility at the national level.

LOOM has a high raising funds profile.

LOOM is very well integrated in regional, national and international networks.

– Weaknesses and threats

Only one post-doc is currently working in the team, as compared to 5 PhD students. The team could certainly benefit from a leverage of this ratio.

Another threat resides in the forthcoming retirement of two of the senior technical staff members and there is therefore a clear risk of loss of know-how and expertise in some areas.

– Recommendations

Keep on developing these high profile instrumental activities, but make sure to increase the number of post-docs in the team. Although the overall publication rate of the LOOM team is already quite good for an instrumental team, efforts should be made to increase the number of refereed publications.

Intitulé UR / équipe	C1	C2	C3	C4	Note globale
LAM-Laboratoire d'Astrophysique de Marseille	A+	A+	A+	A+	A+
Equipe "Cosmology"	*A+*	*A+*	*Non noté*	*A+*	*A+*
Equipe PDG "Physique des galaxies"	*A+*	*A+*	*Non noté*	*A+*	*A+*
Equipe PSEG "Populations stellaires et évolution des galaxies"	*A+*	*A+*	*Non noté*	*A+*	*A+*
Equipe "Dynamique des galaxies"	*A+*	*A+*	*Non noté*	*A+*	*A+*
Equipe MIS "Milieu Interstellaire"	*A+*	*A*	*Non noté*	*A*	*A*
Equipe PASI "Planètes, Atmosphères stellaires et interactions"	*A+*	*A+*	*Non noté*	*A+*	*A+*
Equipe "Solar System"	*A+*	*A+*	*Non noté*	*A+*	*A+*
Equipe LOOM Optique et Instrumentation	*A+*	*A+*	*Non noté*	*A+*	*A+*

C1 – Qualité scientifique et production
C2 – Rayonnement et attractivité, intégration dans l'environnement
C3 – Gouvernance et vie du laboratoire
C4 – Stratégie et projet scientifique

Statistiques de notes globales par domaines scientifiques

(État au 06/05/2011)

Sciences et Technologies

Note globale	ST1	ST2	ST3	ST4	ST5	ST6	Total
A+	6	9	12	8	12	11	58
A	11	17	7	19	11	20	85
B	5	5	4	10	17	8	49
C	2	1	2				5
Total	**24**	**32**	**25**	**37**	**40**	**39**	**197**
A+	25,0%	28,1%	48,0%	21,6%	30,0%	28,2%	29,4%
A	45,8%	53,1%	28,0%	51,4%	27,5%	51,3%	43,1%
B	20,8%	15,6%	16,0%	27,0%	42,5%	20,5%	24,9%
C	8,3%	3,1%	8,0%				2,5%
Total	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Intitulés des domaines scientifiques

Sciences et Technologies

ST1 - Mathématiques
ST2 - Physique
ST3 - Sciences de la terre et de l'univers
ST4 - Chimie
ST5 - Sciences pour l'ingénieur
ST6 - Sciences et technologies de l'information et de la communication