HCERES

High Council for the Evaluation of Research and Higher Education

Research units

HCERES report on research unit:

Laboratoire de Physique Corpusculaire de Clermont Ferrand

LPC Clermont

Under the supervision of the following institutions and research bodies:

Université Blaise Pascal – UBP

Centre National de la Recherche Scientifique – CNRS

Evaluation Campaign 2015–2016 (Group B)

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In the name of HCERES,[1]

Michel Cosnard, president

In the name of the experts committee,[2]

Luigi Rolandi, chairman of the committee

Under the decree N°.2014-1365 dated 14 november 2014,

[1] The president of HCERES "countersigns the evaluation reports set up by the experts committees and signed by their chairman." (Article 8, paragraph 5)

[2] The evaluation reports "are signed by the chairman of the expert committee". (Article 11, paragraph 2)

Evaluation report

This report is the sole result of evaluation by the expert committee, the composition of which is specified below.

The assessments contained herein are the expression of an independent and collegial reviewing by the committee.

Unit name:	Laboratoire de Physique Corpusculaire de Clermont-Ferrand
Unit acronym:	LPC Clermont
Label requested:	UMR
Current number:	UMR 6533
Name of Director (2015–2016):	Mr Alain FALVARD
Name of Project Leader (2017–2021):	Mr Dominique PALLIN

Expert committee members

Chair:	Mr Luigi ROLANDI, CERN/PH, Geneva, Switzerland
Vice-Chair:	Ms Manjit DOSANJH*, CERN/KT, Geneva, Switzerland
Experts:	Mr François COUCHOT, CNRS/IN2P3/LAL, Orsay
	Mr Alain GLEIZES, Laplace, Toulouse
	Mr Raphaël GRANIER DE CASSAGNAC, LLR/École Polytechnique, Palaiseau
	Mr Frédéric GUITTARD*, Université de Nice Sophia Antipolis, Nice
	Ms Fabienne LEDROIT, Université Grenoble-Alpes, CNRS/IN2P3, Grenoble
	Mr François MONTANET*, Université Grenoble-Alpes, CNRS/IN2P3, Grenoble
	Mr Gilbert MOULTAKA, Université de Montpellier, Montpellier
	Mr Ivan TARASSOV*, GMGM, Strasbourg

* Members of subcommittee for Health and Environment (see section 4 / team 4 and section 5).

Scientific delegate representing the HCERES:

Mr Michel GARÇON

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Mr Alain ESCHALLIER, Université d'Auvergne

Mr Pierre HENRARD, Université Blaise Pascal

Mr Serge KOX, CNRS/IN2P3

Representatives of Doctoral Schools:

Mr Jean-Marc LOBACCARO, ED n°65, École Doctorale des Sciences de la Vie, Santé, Agronomie et Environnement

Mr Patrice MALFREYT, ED n°178, École Doctorale des Sciences Fondamentales (EDSF)

1 • Introduction

History and geographical location of the unit

LPC Clermont is a UMR (Unité Mixte de Recherche) under the joint supervision of the University Blaise Pascal and CNRS. It is located on the university campus Les Cézeaux. LPC main activity is research in physics of the fundamental interactions and the laboratory is primarily attached to CNRS/IN2P3 (Institut National de Physique Nucléaire et de Physique des Particules). The diversity of the research of LPC justifies its secondary attachments to CNRS/INP (Institut de Physique) for theoretical physics, to CNRS/INSU (Institut National des Sciences de l'Univers) for cosmology and to CNRS/INSB (Institut des Sciences Biologiques) for biological sciences.

Since its foundation in 1959 the main thrust of LPC has been on particle and hadron physics with participation in experiments in various laboratories including CERN, Fermilab and JEFFERSON Lab.

In the last decade the scope of the research at LPC has been enlarged including multidisciplinary activities at the border between physics and other sciences such as biology, health and earth science; these cover roughly 30% of the activity of the laboratory.

In the context of the new policy for the merging of the two universities in Clermont in the new Université Clermont Auvergne, three research units will be joining LPC on January 1st 2017:

- Laboratoire Arc Électrique et Plasmas Thermiques (LAEPT) whose main scope is the study of the properties of thermal and non-thermal plasmas and the interaction of these plasmas with the environment;
- Mitochondrial Genome Repair (RGM) whose main scope is the study of mitochondrial changes during aging and mitochondrial DNA repair mechanisms;
- Characterization and Biologic security of nanostructured surfaces (C-Biosenss) with the goal to assess the relationship between clinical applications and material sciences.

Management team

The director, the technical manager and administrative manager form the laboratory management team. Deputy directors, in charge of important matters may be appointed for a limited time. They work with large autonomy and have frequent contacts with the director. The technical manager has the responsibility of monitoring the technical actions. The administrative manager directs the administration.

HCERES nomenclature

Domaines scientifiques :

- P : ST2
- S : SVE2

Domaines applicatifs :

- P : Santé humaine et animale
- S : Environnement
- S : Nanosciences, nanotechnologies, matériaux et procédés
- S : Technologies de l'information et de la communication

Scientific domains

LPC is presently reorganizing into six research teams:

The team 'Particles and the Universe' includes activities in the fields of experimental particle physics (D0@Tevatron in Fermilab/Chicago until 2013, ATLAS@LHC at CERN, LHCb@LHC at CERN and preparation for future colliders) as well as astroparticle activities (ANTARES) and observational cosmology (LSST). Research is connected to fundamental physics questions: Standard Models and their extensions, dark matter and dark energy. The groups are involved in physics analysis and in detector construction.

The team 'Quarks and Nuclei' studies the properties of the Nucleon and those of the quark-gluon plasma. They have been involved in experiments at JEFFERSON Lab (Newport News, VA, USA) until 2011 and are now participating in experiments at MAMI in Mainz/Germany and in the ALICE experiment at LHC at CERN. They are contributing to physics analysis and to detector construction.

The team 'Theoretical Physics' works in close connection with 'Particle and Universe' and 'Quarks and Nuclei'. Its research topics include Lattice QCD and non-perturbative methods, Beyond Standard Model Physics, precision tests of the Standard Model and dark matter.

The team 'Health and Environment' includes all activities where the technical competences of the laboratory are exploited for research at the interface with other disciplines. 'Health' includes topics like development and characterisation of biomaterials, dosimetry and online dose control in particle therapy, multi-scale dosimetry and evaluation of radiation-induced damage, radiation therapy physics and e-health & biomedical applications of grids and clouds. 'Environment' includes natural radioactivity and volcanoes, radiation and evolution of living organisms and the use of high-energy muons in the cosmic rays to probe large and dense structures like volcanoes (muography).

The team 'Technological Innovation and Transfer' has been formed only recently to promote research in instrumentation and informatics where the laboratory could develop innovative instruments or systems to be exploited in fields different from pure research.

The team 'Plasma Physics' studies the properties of low-temperature plasmas and the interaction of these plasmas with the environment with emphasis on electric arcs and thermal plasmas. This research domain covers a large number of applications.

Unit workforce

Unit workforce	Number on 30/06/2015 (LPC/LAEPT/RGM/C-Biosenss)	Number on 01/01/2017
N1: Permanent professors and similar positions	46 (32/5/6/3)	47
N2: Permanent researchers from Institutions and similar positions	20 (20/0/0/0)	20
N3: Other permanent staff (technicians and administrative personnel)	53 (47/3/2/1)	53
N4: Other professors (Emeritus Professor, on-contract Professor, etc.)	5 (4/0/1/0)	
N5: Other researchers from Institutions (Emeritus Research Director, Postdoctoral students, visitors, etc.)	5 (4/1/0/0)	
N6: Other contractual staff (technicians and administrative personnel)	3 (3/0/0/0)	
N7: PhD students	31 (26/3/2/0)	
TOTAL N1 to N7	**157 (130/12/11/4)**	
Qualified research supervisors (HDR) or similar positions	45 (33/5/3/4)	

Unit record	From 01/01/2010 to 30/06/2015
PhD theses defended	37 (31/5/1/1)
Postdoctoral scientists having spent at least 12 months in the unit	20 (20/0/0/0)
Number of Research Supervisor Qualifications (HDR) obtained during the period	9 (8/1/0/1)

2 • Overall assessment of the unit

Introduction

LPC Clermont is one of the important laboratories of IN2P3. It has strong involvement in elementary and hadronic particle physics, both in theory and experiments. Its researchers contribute to large international collaborations like ATLAS, LHCb and ALICE at CERN doing research with the most powerful accelerator ever built. They contribute to data analysis with a large number of publications and to detector construction. The theory group has high international reputation.

LPC researchers have consolidated the contribution to observational cosmology with the participation in the Large Synoptic Survey Telescope currently under construction in Chile.

LPC researchers are highly connected to the local multidisciplinary research contributing for example to earth science with tomography of the local volcanoes. They have important involvement in health related research in national collaborations that will be further enlarged in scope with the acquisition of two research units on mitochondrial genome repair and on characterization and biologic security of nanostructured surfaces.

LPC scope will be also enlarged to plasma physics with the merging of the 'Laboratoire Arc Électrique et Plasmas Thermiques'.

The experimental teams rely on highly performing services on electronics, informatics, microelectronics and mechanics. The organization of the laboratory and the scientific leadership offer a stimulating environment for researchers and technical staff resulting in very good scientific production.

Global assessment of the unit

LPC is well established and plays a role recognized at local, national and international levels.

The involvement in three large LHC collaborations with important responsibilities ensures a long-term high quality scientific return at the forefront of elementary and hadronic particle physics.

The recent involvement in Large Synoptic Survey Telescope (LSST) enlarges the scope of the laboratory to high quality observational cosmology.

The consolidation of research activity in high-quality multi-disciplinary domains (biology, medical and earth science) profiting from the instrumentation, techniques and methods developed for fundamental research, creates strong links with the local and national scientific environment.

LPC has strong links with University and contributes to teaching and professional training at different levels.

Strengths and opportunities in the context

The experience developed during several years in LPC in fundamental physics research at the energy frontier resulted in the design, construction and operation of complex detectors, the processing and analysis of data and in

their theoretical interpretations. LPC is involved in international projects of the highest level like ALICE, ATLAS, LHCb and LSST.

The detectors they contributed to build and operate produced data of excellent quality that allowed important discoveries including the Higgs Boson and the measurement of the very elusive branching fraction for the decay of the B_s meson in muon pairs. The new run at LHC offers concrete opportunities for new discoveries.

The cosmology activity with LSST, which started recently with good momentum, will grant LPC privileged access to one of the largest deep surveys over an enormous area of sky with high discovery potential.

The LPC teams rely on four performing technical services (electronics, informatics, microelectronics and mechanics) that offer the full range of skills needed to carry out ambitious experimental projects.

The technical expertise developed for fundamental research has allowed a wealth of spin off in multidisciplinary domains related to health and environment, which have grown to become one of the research unit's specificity. These domains have strong links with the society both at the local and national level. The field of applications is a source of innovation and offers LPC a strong route for innovation and technology transfer and involvement with societal challenges. These activities will profit in the future from synergies with the new research units that are joining the LPC in the next contract.

Medical physics and radiobiology applications are well integrated within the regional and national collaborative networks. There are strong links between the environment studies at LPC and locally strong groups in volcanology and geology.

Weaknesses and threats in the context

The planned merger of the University of Auvergne and Blaise Pascal University in the future University Clermont Auvergne has triggered a policy to define coherent priority research axes among the new university and the local research institutions. Fundamental research is not among the priority axes.

The involvement of LPC in fundamental research results in a good visibility of the laboratory at international level; however the participation of LPC members to the central management of the large experimental collaborations was rather limited.

The contribution of the LPC to the operation of the LHC detectors that they have designed and constructed and to their upgrades requires a continuous commitment of human resources that is more difficult to sustain when the number of permanent researchers and post docs is decreasing.

The possibilities to fund the PhD contracts are decreasing.

Most of the research groups have a large fraction of (assistant) professors with large teaching duties, which lowers their impact in research.

With a few notable exceptions, most of the research groups are formed by a small number of researchers. This fragmentation of the research lines makes them fragile on many aspects.

The LPC technical expertise has strengths that allow planning research and development of instruments and methods that have potentiality to be useful for the society. However in some cases this planning does not include a thorough study of the needs and usefulness of the potential technological transfer.

The recurrent financial support is steadily decreasing with time.

Recommendations

The 'raison d'être' of LPC is fundamental research. Fundamental research is also what makes LPC strong in technical expertise. It should be pursued during the next contract profiting from the participation of the LPC in large international experimental collaborations and from the discovery potential of these researches. The international visibility could be improved also exploiting the potential synergies between the theory group and experimental groups beyond what is already happening. Proactive participation in international conferences organization and editorial activities should be encouraged.

The field of applications is very important for LPC because it boosts its interaction with the local academic, social and economical environment. It gives access to regional and national contracts. It is coherent with the new policy of the site. It relies on the strong technical expertise developed for fundamental research and has developed since its own specific know-how. The resources devoted to this field should not be reduced, however the field should be consolidated on projects with strong and well-defined technological transfer goals building on the success of the presently active projects. This consolidation should profit from the merger with the new research units. International cooperation should be encouraged.

Fundamental research is not among the priority axes defined by the new university and the local research institutions. LPC should be proactive in trying to change these priorities on the basis that without a strong involvement in fundamental research and in the large international experimental collaborations the technological level of the laboratory would rapidly decrease with detrimental effects on its applied research and potentiality for technology transfer. In this context LPC could act in favour of and would benefit from an increased synergy among the high energy physics units of the newly merged region.