Research evaluation

FINAL RESUME ON THE RESEARCH UNIT:
Laboratory for the Use of Lasers at high Intensity (LULI)

UNDER THE SUPERVISION OF THE FOLLOWING INSTITUTIONS AND RESEARCH BODIES:
École Polytechnique - X
Commissariat à l'énergie atomique et aux énergies alternatives – CEA
Centre National de la Recherche Scientifique – CNRS
Sorbonne Université

EVALUATION CAMPAIGN 2018-2019
GROUP E

Report published on April, 03 2019

High Council for evaluation of research and higher education

In the name of Hcéres[1]:	In the name of the experts committee[2]:
Michel Cosnard, President	Cristina Hernandez-Gomez, Chair of the committee

Under the decree No.2014-1365 dated 14 November 2014,

[1] The president of Hcéres "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 experts committee". (Article 11, paragraph 2).

Tables in this document were filled with data provided by laboratories and supervising bodies in the unit's application and in the Excel files "Données du contrat en cours" and "Données du prochain contrat".

UNIT PRESENTATION

Unit name:	Laboratory for the Use of Lasers at high Intensity
Unit acronym:	LULI
Requested label:	UMR
Application type:	Renewal
Current number:	7605
Head of the unit (2018-2019):	Mr Patrick AUDEBERT
Project leader (2020-2024):	Mr Patrick AUDEBERT
Number of teams and/or themes:	Single-team unit / 6 themes

EXPERTS COMMITTEE MEMBERS

Chair:	Ms Cristina HERNANDEZ-GOMEZ, Rutherford Appleton Laboratory, United Kingdom
Experts:	Ms Alicja DOMARACKA, CNRS, Caen (representative of CoNRS)
	Mr Alain GHIZZO, Université de Lorraine, Nancy (representative of CNU)
	Mr Tristan GUILLOT, CNRS, Nice
	Mr Erik LEFEBVRE, CEA, Arpajon
	Mr Stéphane PETIT, CNRS, Talence (supporting personnel)
	Mr Luis ROSO, Spanish Center for Pulsed Lasers, Spain

HCÉRES REPRESENTATIVE

Mr Christian BORDAS

REPRESENTATIVES OF SUPERVISING INSTITUTIONS AND BODIES

Mr Benoît DEVEAUD, École Polytechnique

Ms Thérèse HUET, CNRS

Mr Bertrand MEYER, Sorbonne Université

Mr Daniel VANDERHAEGEN, CEA

INTRODUCTION

HISTORY AND GEOGRAPHICAL LOCATION OF THE UNIT

Laboratory for the Use of Lasers at High Intensity (Laboratoire pour l'Utilisation des Lasers Intenses - LULI) is a joint research unit founded in 1988 through a joint agreement between the "Centre National de la Recherche Scientifique" (CNRS) and "École Polytechnique" (EP). This agreement was then extended to include two other institutions, "Université Pierre et Marie Curie" (UPMC, now Sorbonne Université) in 1994 creating the UMR agreement, and "Commisariat à l'Energie Atomique"(CEA) in 1998.

LULI has been a major contributor to several areas of science and laser technology. It is truly a great asset of France and it is recognised internationally as a centre of excellence. LULI is operating world leading laser facilities with LULI2000 (picosecond (ps) and nanosecond (ns) high-energy high-intensity facility) and ELFIE (femtosecond (fs) high intensity facility), enabling Plasma Physics research both for the French and international scientific community. During this contract period LULI has led the APOLLON project, which is a project of the highest scientific and strategic value to French and European physics communities. This new facility aims to deliver 10 PW (petawatt, 1 PW=1015 W) of laser power, representing a substantial increase in focussed intensities (I > 1022W/cm2) at substantially higher repetition rates than current facilities.

LULI laboratory is located in three sites. The LULI2000 and ELFIE laser facilities are situated at the EP campus at Palaiseau. LULI hosts 67 permanent staff. The majority of the workforce is based at EP campus in close proximity to these two currently operational facilities; this includes the staff supporting operations together with about 70% of the researchers. It is worth pointing out that during the current contract period the EP staff has been moved to better suited offices in a new building block. The remaining research staffs are based at UPMC campus. The new APOLLON facility is located at "L'Orme des Merisiers" site, this required the project and operations staff to be based in temporary accommodation at "L'Orme des Merisiers" site.

MANAGEMENT TEAM

Director: Mr Patrick AUDEBERT
Deputy director: Ms Sylvie JACQUEMOT

HCÉRES NOMENCLATURE

ST2 – Physique.

SCIENTIFIC DOMAIN

LULI operates high energy high power facilities, providing access to national and international scientific communities conducting ground-breaking research in laser plasma interaction and high energy density science. In the interaction of a high power laser pulse with matter, material is instantly vaporised, ionised, heated, compressed and very quickly truly extreme conditions evolve. The highest ever man-made pressures, temperatures, densities, electric fields, magnetic fields, accelerations etc., have all been created by the interaction of a high power laser with matter. It is an incredible and unique tool to undertake scientific investigations. Over the contract period LULI has been operating two laser facilities LULI2000 and ELFIE, as well as developing APOLLON, enabling research in both High Energy Density Physics and Ultra-High Intensity Physics.

LULI has several scientific teams focussing on laser plasma interaction research programmes covering the following themes: atomic physics and radiation, high energy density physics (this includes laser fusion, warm dense matter, laboratory astrophysics and planetology) and applications, high field physics and secondary sources and applications.

UNIT WORKFORCE

	Unit workforce	
	Laboratory for the Use of Lasers at high Intensity	
Active staff	**Number 30/06/2018**	**Number 01/01/2020**
Full professors and similar positions	3	3
Assistant professors and similar positions	1	1
Full time research directors (Directeurs de recherche) and similar positions	6	5
Full time research associates (Chargés de recherche) and similar positions	6	6
Other scientists ("Conservateurs, cadres scientifiques des EPIC, fondations, industries, etc.")	1	
High school teachers		
Supporting personnel (ITAs, BIATSSs and others, notably of EPICs)	50	48
Permanent staff	**67**	**63**
Non-permanent professors and associate professors, including emeritus	2	
Non-permanent full time scientists, including emeritus, post-docs	16	
PhD Students	10	
Non-permanent supporting personnel	15	
Non-permanent staff	**33**	
Total	**100**	**63**

GLOBAL ASSESSMENT OF THE UNIT

LULI is a unique national asset that delivers a world-class plasma physics research programme. LULI brings together plasma physics research and laser technology development, offering access to leading laser installations in both high energy density (HED) and ultra-high intensities (UHI) regimes. LULI is recognised internationally as a centre of excellence.

LULI is leading the development of APOLLON, which is expected to be among the most powerful lasers operating in the next five years worldwide. Progress made on APOLLON is encouraging, with commissioning experiments already being planned. Scientists are eagerly awaiting the start of operations and high impact science output is expected. The delivery of the APOLLON project will secure LULI's international leadership in the strategically important field of Ultra High Intensity science.

LULI2000 remains an essential facility nationally for its ability to perform competitive HED science. It plays a critical role as a medium scale facility supporting exploratory experiments prior to the ambitious experimental campaigns in larger facilities like LMJ-PETAL (LMJ=Laser mégajoule). LULI2000 continues to have a big role in the training of the next generation of scientists.

With upcoming major facilities like APOLLON, LMJ and PETAL it is critical for France to grow the next generation of scientists and engineers. LULI has provided excellent training opportunities to undergraduates, PhD students and postdocs in both laser technology and plasma physics.

The broad spectrum of skills of researchers, engineers and support staff allows LULI to address topics ranging from laser physics, optics, instrumentation, atomic physics, hot plasma physics to astrophysics and QED by combining theory, experimentation on large laser installations, numerical simulations and high performance computing. The nature of research is therefore multidisciplinary with applications that are important for society, while maintaining a strong fundamental component at the frontier of knowledge.

The overall opinion of the committee is extremely positive. LULI is well equipped to approach the next contract period with confidence and maintain its level of excellence. Uncertainty on the funding after the end of the CILEX Equipex beyond 2020 has led to some difficult decisions such as the closing of the ELFIE facility, which has been successfully used by the research community in the past five years. The laboratory is to be commended for its efforts in dealing with this difficult situation. Funding should be sought to secure the operations of both APOLLON and LULI2000 into the next period.

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Evaluation of higher education and research institutions
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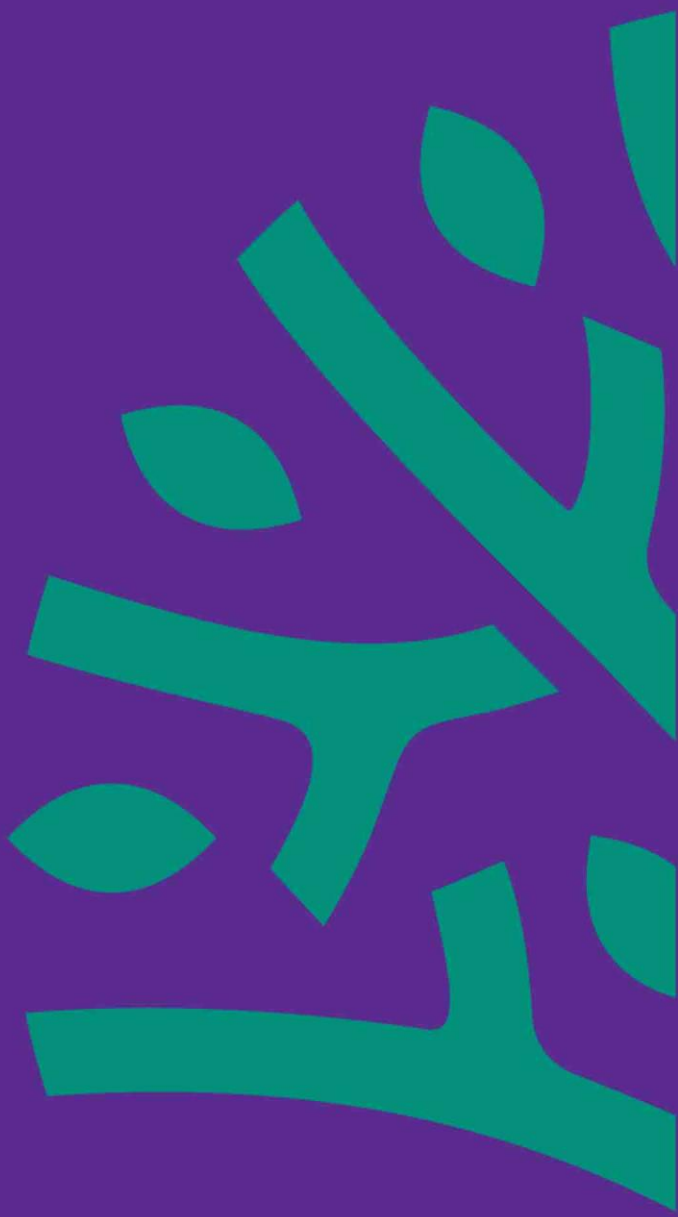

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