

## APC - Astroparticule et cosmologie

Rapport Hcéres

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## REPORT ON THE RESEARCH UNIT:

Astroparticule and Cosmology

APC

## UNDER THE SUPERVISION OF THE FOLLOWING INSTITUTIONS AND RESEARCH BODIES:

Université Paris Diderot

L'Observatoire de Paris

Centre National de la Recherche Scientifique -  
CNRS

Commissariat à l'énergie atomique et aux  
énergies alternatives - CEA

**ÉVALUATION CAMPAIGN 2017-2018**  
**GROUP D**



In the name of Hcéres<sup>1</sup> :

Michel Cosnard, President

In the name of the expert committee<sup>2</sup> :

Steven Ritz, Chairman of the committee

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

<sup>1</sup> The president of HCERES "countersigns the evaluation reports set up by the expert committees and signed by their chairman." (Article 8, paragraph 5);

<sup>2</sup> The evaluation reports "are signed by the chairman of the expert committee". (Article 11, paragraph 2).

This report is the sole result of the unit's 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 PRESENTATION

<b>Unit name:</b>	Astroparticule and Cosmology
<b>Unit acronym:</b>	APC
<b>Requested label:</b>	UMR
<b>Application type:</b>	Renewal
<b>Current number:</b>	UMR 7164
<b>Head of the unit (2017-2018):</b>	Mr Stavros KATSANEVAS
<b>Project leader (2019-2023):</b>	TBC

**Number of teams or themes:** 5 + one hosted team

## COMMITTEE MEMBERS

**Chair:** Mr Steven RITZ, University of California Santa Cruz, USA

**Experts:** Mr Reza ANSARI, University of Paris Sud & CNRS, IN2P3 LAL (Orsay)  
Mr Éric DELAGNES, CEA  
Mr Dominique DUCHESNEAU, CNRS, In2p3 LAPP  
Ms Piera GHIA, CNRS, In2p3 (representative of CoNRS)  
Ms Mariana GRAÑA, CEA  
Mr François MONTANET, CNRS, In2p3 (representative of CNU)  
Mr Stefano VITALE, University of Trente, Italy

**HCERES scientific officer:**

Mr Yannis KARYOTAKIS

**Representatives of supervising institutions and bodies:**

Ms Ursula BASSLER, CNRS  
Mr Claude CATALA, l'Observatoire de Paris  
Ms Sonia COLETTE-MAATOUK, CEA  
Ms Sylvie ROUSSET, université Paris Diderot  
Mr Laurent VIGROUX, CEA

## INTRODUCTION

### HISTORY AND GEOGRAPHICAL LOCATION OF THE UNIT

The AstroParticle and Cosmology (APC) laboratory was founded in 2005 by the CNRS, in particular IN2P3 (Institut National de Physique Nucléaire et Physique des Particules), the University of Paris Denis Diderot, the CEA (Commissariat à l’Energie Atomique et aux Energies Alternatives) and the Observatory of Paris, to foster in France the activities in astroparticle physics and cosmology theory and experiment that were emerging. Since the founding of APC, each of its areas of interest has thrived, with frequent and exciting new results and opportunities. As these areas evolved quickly, the APC organization adapted accordingly. There was an auto-evaluation report covering only the first two years 2005-2006, then a report describing the activities during the period 2007-2012. The current report covers the period from January 2012 to June 2017. APC is located in the Building Condorcet, 10 Rue Alice Domon et Léonie Duquet, with an annex (Computing centre FACe) currently at 13 Rue Watt, both at 75013.

### MANAGEMENT TEAM

Mr Stavros KATSANEVAS	Director
Mr Sotiris LOUCATOS	Deputy director research
Mr Antoine KOUCHNER	Deputy director education
Ms Emmanuelle FOISSAC	Deputy director administration
Mr Thomas ZERGUERRAS	Deputy Technical director

### HCERES NOMENCLATURE

ST2 Physique  
 ST2\_1 Physique nucléaire et particules  
 ST3\_3 Astronomie, univers

### SCIENTIFIC DOMAIN

The work is currently organized into the following main themes of overlapping interest: Cosmology, ranging from the study of the Cosmic Microwave Background (CMB) to the determination of the nature of dark energy using observatories on ground and in space; Gravitation, namely gravitational-wave astrophysics using ground-based and spaced-based detectors, and associated fields; High Energy Astrophysics, studying some of the most powerful phenomena in the Universe in a multimessenger context, from X-rays and Gamma rays to neutrinos and charged-particle cosmic rays; and Neutrinos and dark matter, in particular the determination of the nature and mass of neutrinos and dark matter and their impact on cosmological structure formation. APC has a strong Theory group in all the above themes, working in connection with the experimentalists.

A key aspect of APC is the presence of six technical departments, which provide the technical expertise required by the projects. They are organized according to their different skills: Mechanics, Electronics, Microelectronics, Instrumentation, Informatics, and Project Quality Procedures. Their work develops within and around a data science platform created in 2010 the François Argo Centre FACe, four laboratories (Millimetric, Photodetection, Optics, Integration and Test (AIT/AIV)) and two workshops (Mechanics, Assembly Hall). Furthermore, the APC currently hosts the Energy Physics Group, whose interdisciplinary research includes understanding and modeling basic mechanisms and their potential application to novel energy systems.

## UNIT WORKFORCE

Unit workforce	Number 30/06/2017	Number 01/01/2019
<b>Permanent staff</b>		
Full professors and similar positions	10	11
Assistant professors and similar positions	12	10
Full time research directors (Directeurs de recherche) and similar positions	14	19
Full time research associates (Chargés de recherche) and similar positions	17	19
Other scientists ("Conservateurs, cadres scientifiques des EPIC, fondations, industries, etc.")	6	6
High school teachers	0	0
Supporting personnel (ITAs, BIATSSs and others, notably of EPICs)	48	47
<b>TOTAL permanent staff</b>	<b>107</b>	<b>112</b>
<b>Non-permanent staff</b>		
Non-permanent professors and associate professors, including emeritus	2	
Non-permanent full time scientists, including emeritus, post-docs	26	
Non-permanent supporting personnel	15	
PhD Students	32	
<b>TOTAL non-permanent staff</b>	<b>75</b>	
<b>TOTAL unit</b>	<b>182</b>	

## GLOBAL ASSESSMENT OF THE UNIT

During the evaluation period, APC made very significant contributions to all its fields of research. APC continued its reputation for excellent productivity, including (according to APC) 1105 publications in the review period. Of these, 12 are "renowned" (>500 citations) and 18 are "famous" (250-500 citations). There have also been numerous prestigious prizes and awards to APC researchers, including the Gruber Prize, the Breakthrough Prize in Fundamental physics, and Unesco-L'Oréal prizes for women in science. The laboratory structure has evolved appropriately and strategically, based on the needs of the dynamic fields of research and the needs of the member groups. Staff members continue to engage in important and effective roles in French public outreach activities. Overall, the Committee evaluates the APC as excellent.

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