

**Research evaluation** 

## FINAL RESUME ON THE RESEARCH UNIT: Laboratory of Condensed Matter Physics (SPEC)

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

Commissariat à l'énergie atomique et aux énergies alternatives – CEA Centre national de la recherche scientifique – CNRS

### **EVALUATION CAMPAIGN 2018-2019** GROUP E

Rapport publié le 14/03/2019



In the name of Hcéres<sup>1</sup>:

Michel Cosnard, President

In the name of the experts committee<sup>2</sup>: Sébastien Balibar, Chair of the committee

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

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

<sup>2</sup> 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 of Condensed Matter Physics
Unit acronym:	SPEC
Requested label:	UMR
Application type:	Renewal
Current number:	3680
Head of the unit (2018-2019):	Mr François Daviaud
Project leader (2020-2024):	Currently under discussion
Number of teams and/or themes:	7

### **EXPERTS COMMITTEE MEMBERS**

Chair:	Mr Sébastien Ballbar, École normale supérieure, Paris
Vice-Chair:	Mr Hervé Courtois, Université Grenoble Alpes
Experts:	Mr Stéphane Berciaud, Université de Strasbourg
	Mr Xavier Blase, CNRS, Grenoble
	Ms Sylvie Godey, CNRS, Lille (supporting personnel)
	Mr Michel HEHN, Université de Lorraine
	Mr Alain Pocheau, Aix-Marseille Université
	Ms Nathalie VIART, Université de Strasbourg (representative of CoNRS)

## **HCÉRES REPRESENTATIVE**

Ms Marie-France BEAUFORT

### **REPRESENTATIVES OF SUPERVISING INSTITUTIONS AND BODIES**

Mr Hervé Desvaux, CEA

Mr Niels Keller, CNRS

## INTRODUCTION



#### HISTORY AND GEOGRAPHICAL LOCATION OF THE UNIT

The Condensed Matter Physics Laboratory (SPEC) is a basic research laboratory located in the Paris Saclay University campus. Most of its members are in a free-access area called l'Orme des Merisiers, some others in the main area of CEA Saclay, a few kilometres away.

Since January 2015, SPEC is proposed to become a Joint Research Unit (UMR) of the Commissariat à l'Énergie Atomique et aux Energies Alternatives (CEA) and the Centre National de la Recherche Scientifique (CNRS). It was previously a Research Associated Unit (URA). Inside the CEA, SPEC is part of the Saclay Radiation and Matter Institute (IRAMIS), which is itself a part of the Direction of basic research (DRF) of the CEA. On the CNRS side, SPEC is related to the Physics Institute (INP).

Due to an internal reorganization of IRAMIS in January 2014, around 25 permanent staff from SPCSI localized on the main area of CEA Saclay joined SPEC, while the Molecular Electronics group (led by V. Derycke) and the Laboratory for Research on Physical Sciences (LARSIM, humanities group led by Mr Étienne Klein) left the SPEC respectively for NIMBE and IRFU. As a consequence, the SPEC staff is localized in two sites since 2014, and today the main administrative project is still to gather everybody on the same site, namely l'Orme des Merisiers.

#### MANAGEMENT TEAM

Mr François Daviaud is director of the SPEC since October 2012. He was deputy director from 2003 to 2011. Mr Patrice Roche is the deputy director since September 2011 and still assuming this responsibility today. L. Barbier was the second deputy director from January 2014 to October 2014 and was replaced by Ms Céline Fiorini-Debuisschert from October 2014 to October 2018. She was replaced in November 2018 by Ms. Myriam Pannetier-Lecoeur, who was already in charge of several missions for the direction of SPEC.

#### HCÉRES NOMENCLATURE

ST2 - Physique.

#### SCIENTIFIC DOMAIN

The activities of SPEC concern the physics of condensed matter: mesoscopic physics and quantum electronics, nanomagnetism, nanophotonics, surface physics, statistical and complex systems physics. This research is developed in experiments, theory and numerical simulations. It is also directly linked to the basic research missions of the CEA in physics as well as in information technologies and alternative energies.



#### UNIT WORKFORCE

	Unit workforce Laboratory of Condensed Matter Physics	
Active staff	Number 30/06/2018	Number 01/01/2020
Full professors and similar positions	0	0
Assistant professors and similar positions	0	0
Full time research directors (Directeurs de recherche) and similar positions	2	1
Full time research associates (Chargés de recherche) and similar positions	2	3
Other scientists ("Conservateurs, cadres scientifiques des EPIC, fondations, industries, etc.")	53	53
High school teachers	0	0
Supporting personnel (ITAs, BIATSSs and others, notably of EPICs)	31	26
Permanent staff	88	83
Non-permanent professors and associate professors, including emeritus	1	
Non-permanent full time scientists, including emeritus, post-docs	105	
PhD Students	29	
Non-permanent supporting personnel	27	
Non-permanent staff	133	
Total	221	83



### **GLOBAL ASSESSMENT OF THE UNIT**

The SPEC activity is devoted to basic research by exploring the frontiers of fundamental science and to its applications by establishing industrial collaborations when relevant. The SPEC fulfils perfectly the above missions. The committee has noticed the following highlights in the scientific achievements of the teams. The topics go from the most fundamental fields to applications of great societal interest: dynamical Coulomb blockade, ESR of small spin ensembles, p-n graphene junctions, heat dissipation at the sub-micron scale in silicon nanowire arrays, spintronic magnetic sensors, growth of oxide films, polar domain walls in the non-polar oxide CaTiO<sub>3</sub>, development of spintronics-based magnetic sensors for large volume applications, self-assembled tectons grafted on graphene, observation of extreme events of inertial dissipation in fluids etc.

The foundation of the common laboratory SPEC-Crivasense Technology and the launch of the GIS "Cryopole" within Paris-Saclay University attest for the ability to lead fruitful and constructive collaborations with industrial partners together with academic laboratories.

The committee is very much impressed by the quality, creativity and diversity of the scientific activity in the SPEC and by its technology level. The committee noticed an excellent atmosphere in the teams, the platforms and the services. The SPEC has a really collective working spirit which certainly contributes to its success. The director and his team obviously have a key-role in this success. More than hundred articles per year from which a fifth in the 10% most cited in each domain, about fifty invited communications each year in international conferences, about fifteen awards in four years, eight senior visitors, seven laureates of the ERC, about thirty patents and industrial contracts, the creation of a start-up and a common laboratory, an industrial chair, all these indicators demonstrate the exceptional richness of SPEC and its excellent recognition.

The supervision and scientific management of young researchers is remarkable.

The SPEC has no real weakness, only some difficulties which the direction faces as well as possible but which spoil the serenity that is necessary to do research at the best level. The annual allocation does not cover all the expenses for the permanent members salaries and the infrastructure. Every year, several hundred thousand Euros are missing. The IRAMIS decision to re-configurate the SPEC forced the SPEC decision to gather all teams on Les Ormes site. This operation has a cost, which has been evaluated as 1.5 Million Euros. The committee considers that the 400 k€ amount offered by IRAMIS is not sufficient. The committee was surprised when realizing that, five years after the decision to create a CEA-CNRS UMR, the convention is not yet signed. This can further delay partnerships with the industry. Moreover, it also delays the association with the Paris-Saclay University, whereas it is necessary for the SPEC to be associated with the local university.

The committee congratulates the administrative services for the quality of their contribution to the excellence of the SPEC research, especially since their activity is made more complex by the increasing number of grants. The committee also congratulates the members of the technical support team who are devoted to the optimisation of the technologies used by the research teams, share their expertise at the scale of the whole laboratory and also often permit to outside teams to benefit from them.

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2 rue Albert Einstein 75013 Paris, France T. 33 (0)1 55 55 60 10

