

AGREEMENT
BETWEEN
THE CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE
AND
THE CONSORTIUM INSTITUTO DE ASTROFÍSICA DE CANARIAS,
OF THE KINGDOM OF SPAIN,
RELATING TO THE RENEWAL OF THE
INTERNATIONAL RESEARCH LABORATORY
“FRENCH-SPANISH LABORATORY FOR ASTROPHYSICS IN CANARIAS”
(“FSLAC”)

BETWEEN

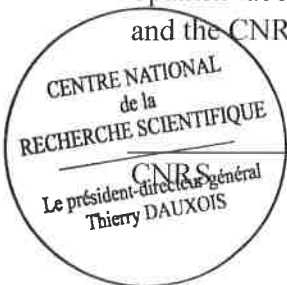
The **CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE**, hereinafter referred to as the “**CNRS**”, a French public scientific and technological institution, with headquarters at 3, rue Michel-Ange 75794 Paris cedex 16, France, represented by its Chairman – Chief Executive Officer, **Mr. Thierry DAUXOIS**,

AND

The **CONSORCIO INSTITUTO DE ASTROFISICA DE CANARIAS**, hereinafter referred to as the “**IAC**”, a Spanish Public Research Organization, with headquarters at Calle Vía Láctea, s / n, 38201 San Cristóbal de La Laguna, Santa Cruz de Tenerife, Spain and CIF Q3811001A, represented by its Director, **Mr. Valentín MARTÍNEZ PILLET**, by virtue of the appointment made by the Governing Council of the IAC on January 17, 2025, and with the powers conferred upon him under Law 14/2011, of June, on Science, Technology, and Innovation, and in the Statutes of the IAC (BOE of December 21, 2018).

The CNRS and the IAC shall be referred to jointly as the “**Parties**” and individually as a “**Party**”. Both Parties recognize their legal capacity to enter into this agreement.

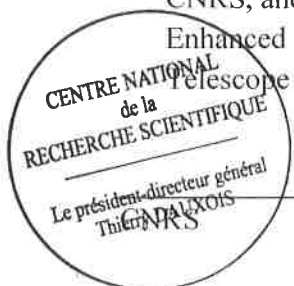
In view of the agreement for the creation of the international research laboratory French – Spanish laboratory for astrophysics in Canarias “FSLAC”, signed on March 15, 2021 by IAC and the CNRS.



PREAMBLE

WHEREAS:

- The Centre National de la Recherche Scientifique is a public organization operating under the authority of the French Ministry of Higher Education, Research and Space (MESRE). As the largest fundamental research organization in Europe, the CNRS conducts research across all fields of knowledge through its ten institutes.
- The Instituto de Astrofísica de Canarias is a Spanish public research organization, legally constituted as a Public Consortium and composed of the General State Administration, the Public Administration of the Autonomous Community of the Canary Islands, the University of La Laguna, and the Spanish National Research Council, in accordance with Law 14/2011 of 1 June on Science, Technology and Innovation, and also in conformity with the IAC Statutes approved by the General Secretariat for the Coordination of Scientific Policy (Official State Gazette of 21 December 2018).
- Pursuant to Article 149.1.15 of the Spanish Constitution of 29 December 1978, the General State Administration holds exclusive competence over the promotion and general coordination of scientific and technical research.
- In accordance with its Statutes, the purposes of the IAC include astrophysical research, the development of scientific instrumentation, the training of research personnel, the administration of the Canary Islands Observatories, and the dissemination of scientific knowledge.
- The Kingdom of Spain has opened the IAC observatories to the international scientific community since the signing of the International Treaty entitled "*Agreement on Cooperation in Astrophysics and its Protocol*" on 26 May 1979, a Treaty to which the French Republic acceded on July 2 1992.
- The Parties have been engaged, since 1980, in the framework of the building and exploitation of the French telescope THEMIS in Tenerife (Spain) and foresee to develop further, beside THEMIS exploitation, their collaboration by their mutual involvement in the forthcoming Cherenkov Telescope Array (CTA, ESFRI roadmap 2016) facilities development in Canarias (La Palma) and in the framework of the Cosmic Microwave Background (CMB) observation with the development of a spectrometer installed on the QUIJOTE telescope (Tenerife).
- On 15 March 2021, the CNRS and the IAC entered into an agreement establishing the International Research Laboratory known as the "*French-Spanish Laboratory for Astrophysics in Canarias (FSLAC)*", under CNRS reference IRL2009, for the period from 1 January 2021 to 31 December 2025.
- More recently, these activities have expanded to include the physics of exoplanets through the ExoLife Finder (ELF) telescope project and the European project "Cutting Edge Leap to Excellence in Space and Optics Technologies" (CELESTE), involving the IAC, the CNRS, and the ESA, as well as the physics of galactic archaeology carried out by the WHT Enhanced Area Velocity Explorer (WEAVE) instrument installed at the William Herschel Telescope (WHT).



The aim of the international research laboratory is therefore to contribute to strengthen and ease the scientific and instrumental French-Spanish activities in the Canary Islands (Spain) around these common astrophysical activities.

This Agreement is considered an International Administrative Agreement subject to International Law, in accordance with the provisions of Article 2.b of Spanish Law 25/2014 on Treaties and other International Agreements.

The Parties have agreed as follows:

Article 1 – Purpose

The purpose of this Agreement is to renew the international research laboratory between the Parties known as the “French-Spanish Laboratory for Astrophysics in Canarias (FSLAC)”.

Details of the scientific Program of the Laboratory (hereinafter referred to as “Program”) are provided in Annex 1, which is attached to this agreement (hereinafter referred to as “Agreement”).

The Laboratory is located at San Cristóbal de La Laguna (Tenerife, Spain) and Santa Cruz de La Palma (La Palma, Spain) as indicated in Annex 3.

The Laboratory is placed under the joint responsibility of the Parties, which provide it with staff and resources.

The CNRS code number of the Laboratory is: IRL2009.

It is not the purpose nor effect of the Agreement, and nothing herein may be construed in this respect, to form, create, make effective or even acknowledge the creation of a joint venture, a mandate, a company, and interest group or any other commercial group or entity, or a de facto company between the Parties.

Article 2 – Membership

Subject to the prior agreement of all the Parties, other entities may be invited to accede to this Agreement by signing the corresponding instrument of accession, in accordance with the model set out in Annex 4, provided that such accession is carried out in compliance with the applicable legal procedure and regulations, and that the acceding entity meets the applicable legal and statutory requirements.



By signing the deed of accession, the new Party undertakes to comply with all the provisions of the Agreement. From the date of its accession and for the duration of the accession:

- It becomes a member of the Steering Committee with voting right,
- It becomes a co-owner of the Results generated from that date, under the conditions set out in Article 12,
- Its name appears alongside that of the other Parties when the Laboratory is mentioned.

It undertakes to contribute to the Laboratory financially, in personnel or otherwise, for the duration of its membership. The commitments and duration are set out in detail in the deed of accession.

Article 3 – Starting Date - Term – Renewal – Termination

This Agreement shall remain in force for a period of five (5) years, from 1 January 2026 to 31 December 2030, and shall be published in the Official State Gazette of Spain.

At any time, before the end of the period referred at the beginning of this article, the Parties may unanimously agree on its extension for a period of up to five additional years.

This Agreement may be terminated in advance when incurring in the following causes of resolution:

- The course of the term of validity of the Agreement without having agreed the extension of the Agreement.
- The unanimous agreement of the Parties.
- Failure to comply with the obligations and commitments assumed by any of the Parties.

In this case, either Party may notify the defaulting Party of the requirement to comply with the obligations or commitments that are considered to be unfulfilled within a given period. This requirement shall be communicated to the person responsible for the monitoring and control mechanism of the implementation of the Agreement.

If the period indicated in the requirement persists, the Party who initiated it shall notify the other signatory Party of the concurrence of the cause of resolution and the Agreement will be terminated. This termination may result in compensation for damages caused if this had been foreseen.

- By judicial decision declaring the nullity of the Agreement.
- For any other exceptional cause as provided for in the Agreement, or by laws.

On those other exceptional and justified grounds, the Laboratory may be terminated prior to the end of the first five (5) years, or under the agreed extension, with a year's notice. In this case, the Parties shall endeavour to successfully complete the joint initiatives that have been started.



The renewal, or non-renewal, or termination decision, is taken by the Parties following an opinion from the Parties' relevant statutory bodies, the Laboratory's General Assembly and Steering Committee.

Notwithstanding the expiry or termination of this collaboration, the provisions of Publications and Communication, Results and Confidentiality shall survive.

Article 4 – Management of the Laboratory

The Director of the Laboratory is appointed jointly by the Parties for a five (5) year term, renewable once, following the opinion of the relevant statutory bodies. Should the term of office be interrupted, the Director's replacement shall be appointed according to the same procedure.

On the effective date of this Agreement, the Director of the Laboratory is Dr Ramon García López. The Director is assisted by a Deputy Director, who, on the effective date of this Agreement, is Dr Bernard Gelly. The Deputy Director is appointed by the Parties for the term of this Agreement.

The Director is responsible for managing all the resources provided to the Laboratory and approves any secondment of staff to the Laboratory and all the resources allocated to the Laboratory by third parties. The Director is responsible for choosing trainee researchers.

At mid-term, the Director drafts an activity report, which will be sent to both Parties.

Article 5 – Steering Committee – Monitoring of the Agreement

The Laboratory has a Steering Committee, composed of four (4) full members, with entitlement to vote:

- the Director of the CNRS Earth & Space or his/her representative;
- one representative appointed by the CNRS;
- the Director of IAC, or his/her representative;
- one representative appointed by the IAC.

Two (2) to four (4) persons may be appointed as members from outside the Laboratory chosen by joint agreement between the Parties for their expertise with advisory capacity only and subject to the signature of confidentiality agreements.

The Chairperson of the Steering Committee is appointed by the Parties from amongst full members. The term of office of Steering Committee members is five years.



The Director and the Deputy Director of the Laboratory will attend the meetings of the Steering Committee with an advisory voice and will establish the topics to be discussed and prepare a progress report and projection of the work program.

The Steering Committee meets at the initiative of the Steering Committee full members or at the request of its Laboratory Director as often as the interests of the Laboratory need it. It meets electronically on a need-based basis, and at least once a year, with a mandatory meeting being held prior to the Laboratory's renewal.

The decisions of the Steering Committee are adopted by consensus between the full members being present or represented.

The Steering Committee approves the provisional budget and the financial and scientific reports every year.

The Steering Committee makes suggestions concerning the Laboratory's scientific directions and verifies implementation thereof. It shall:

- assess the Scientific Program's implementation as well as its status and progress;
- make recommendations as to the Laboratory's research program and the requests for resources required to conduct it.

The Steering Committee may also study all others matters relating to the Laboratory. In particular, and if needed, the Steering Committee can draft rules of procedure for the Laboratory in consistency with the Parties applicable bylaws and subject to the prior approval of each Party.

The Steering Committee is responsible for the monitoring of this Agreement, controlling its implementation and the fulfillment of the commitments acquired by the Parties. This Committee will solve problems of interpretation and compliance that may arise with respect to the Agreement.

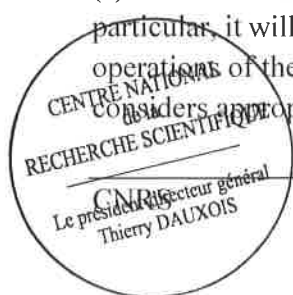
Article 6 – General Assembly

6.1. Composition

The Laboratory's headcount being less than thirty (30) personnel, it will have a General Assembly composed of all of the staff seconded to the Laboratory.

6.2. Missions and running

(a) The General Assembly, chaired by the Laboratory's Director, will be an advisory body. In particular, it will provide its opinion on any measure relating to resources, the organization and operations of the Laboratory and, more generally, on any matter that the Laboratory's Director considers appropriate to refer to it.



(b) The General Assembly shall meet three times a year and such meetings shall be convened by its Laboratory Director, either at the Director's initiative, or at the request of a third of its members. Following an invitation from the chairperson, it may hear any person involved in the Laboratory's work or called as an expert in respect of an item on the agenda.

(c) As and when required, by-laws dictate the other operating rules.

Article 7 – Allocation of resources

During the term of this Agreement, the Parties shall allocate and maintain their own resources, which each of them will designate, for the achievement of the common Laboratory, and at an appropriate level.

As for human resources, the Parties second staff to the Laboratory. A list of the Laboratory's staff (seconded staff and collaborators) is attached in Annex 2 to this Agreement. It is updated by the Laboratory's Director every year and forwarded it to the Steering Committee.

In terms of financial resources, the IAC and CNRS's contributions to the Laboratory for the first year is specified in Annex 2.

It is the responsibility of each Party to guarantee and to apply the appropriate legal instrument for the secondment of its staff to the Laboratory, in accordance with its own labour regulations.

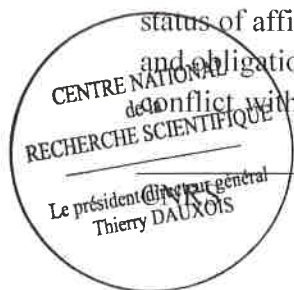
The Parties shall keep each other mutually informed of staff movements. Either Party may, within one (1) month from the receipt of the notification, provide the other with its justified refusal of the secondment of staff.

In the event of a noticeable increase in the number of staff seconded to the Laboratory, a reassessment of the material resources required is carried out together with the Laboratory's Director.

As regards its staff, each Party remains bound by all the responsibilities and obligations relating to its capacity as employer.

The staff seconded to the Laboratory report to the Director and are subject to the disciplinary procedures in force in the Laboratory, without such in any way altering their rights and duties under their respective statuses.

FSLAC staff not employed by IAC involved in the development of the Program acquire the status of affiliated research and/or technology staff at IAC, under the terms and with the rights and obligations recognized by the procedure approved by IAC for this purpose, which shall not conflict with the provisions of the Agreement. In case of contradiction, the Agreement shall prevail.



prevail. The status of Affiliated Researcher at IAC does not create an employment relationship between staff not employed by IAC and IAC.

The IAC provides the Laboratory with the premises located at La Laguna (Tenerife, Spain) and Santa Cruz de La Palma (La Palma, Spain), as indicated in Annex 3, and ensure the maintenance for which the owner is responsible. Infrastructure expenses will be specified in the Laboratory's provisional budget, once the Parties have agreed as to their nature and amount.

Researchers involved in the Laboratory have an access to the open time accessible to any of the Parties, subject to the specific selection process and rules, especially concerning health and safety, applicable for each infrastructure mentioned in the Annex 3.

Article 8 – Publications and Communication

The Parties shall communicate to one another any information required to carry out the joint research work. The publication of scientific results shall take place in line with common practice in the scientific world.

8.1. Reference to publications

Publications by the staff seconded to the Laboratory shall mention the connection with the institutional affiliations in single-line mode with the name of the Laboratory in full as:

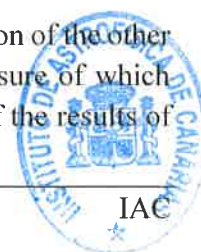
- Name of author(s),
- French-Spanish Laboratory for Astrophysics in Canarias (FSLAC), CNRS – IAC International Research Laboratory, code number IRL2009.

8.2. Communication

The Parties wish to improve the visibility of research work and equip themselves with tools enabling the amount of publications and scientific renown of their laboratories to be reliably gauged. To this end, the Parties undertake to implement a system for the filing of researchers' publications in electronic format, in particular, in an open archive system such as HAL.

Subject to the respect of the Confidentiality provisions set forth in Article 13, any and all communication to the public related to the work carried out in common within the Laboratory shall be subject, during the term of this Agreement and for two (2) years after its expiry date, to the agreement of the other Party which shall notify its written decision within two (2) months after the receipt of the draft publication at the latest. Thereafter and in the absence of any objection, agreement shall be deemed to have been given.

Consequently, all draft publications or communications are referred for the opinion of the other concerned Party, which may remove or change certain information, the disclosure of which may compromise industrial and commercial use, under optimum conditions, of the results of



the work carried-out in common within the Laboratory. Such removals or changes shall not compromise the scientific value of the publication or the communication.

Moreover, one Party shall be able to ask for a delay in publication or communication of a maximum period of 18 (eighteen) months as and from the demand, if some information contained in such publication or communication have to be protected under industrial property rights.

No Party shall use the name, crest, logo or registered image of the other in a press release or promotional materials, without the prior written consent of the other.

Article 9 – Laboratory notebooks

Pursuant to a quality policy, the use of laboratory notebooks is mandatory in the Laboratory.

The laboratory notebooks are owned jointly by the Parties.

The Laboratory's Director is responsible for the notebooks' rules of use and in this respect, the Director shall ensure, in particular, that the notebooks are archived.

The Laboratory's Director can authorise copying for the personal use of the authors of the notebooks.

Article 10 – Partnership agreements

All partnership agreements the Laboratory wishes to conclude with public or private third party organisations of any nationality, will state that it is "on behalf of the FLSAC International Research Laboratory" and be signed by the Party that has been designated to negotiate the contract by the Laboratory Director, unless otherwise agreed upon by the Parties.

During the negotiation, a final draft of these agreements shall be communicated to the other Party who shall be given fifteen (15) days to confirm their approval on this version. Subsequent to this fifteen (15) day period, the opinion is deemed to be favourable.

The Party in charge of the negotiation shall ensure that the agreements comply with the provisions of this Agreement in terms of intellectual property, confidentiality and publication of the results, with the right for the relevant researchers to mention their work in their activity report.



Parties shall enter into separate agreements with legal representatives of the Laboratory's collaborators or any other staff who are not seconded to the Laboratory before any collaboration notably before those aiming to perform scientific projects mentioned in Annex 2.

Partnership agreements may be concluded with French or European agencies (e.g. the French National Research Agency (ANR), the European Commission (EC)) or Spanish agencies). In these cases, such agreements and, if any, their affiliated contracts (non-disclosure agreement, consortium agreement, etc.) with French agencies shall be negotiated, signed and managed by the CNRS. Contracts with Spanish agencies shall be negotiated, signed and managed by IAC. Contracts with European agencies shall be negotiated, signed and managed by CNRS or IAC on a case by case basis.

Article 11: Notifications

Each Party shall identify a designated contact to develop and coordinate the specific activities agreed upon. The designated contacts for the purposes of this Agreement shall be:

- For the CNRS: dr16.SPV@cnrs.fr (CNRS Delegation Paris Normandie Partnership and Research Promotion Office)
- For the IAC: direccion@iac.es (Office of the Director of the IAC).

Article 12 - Results

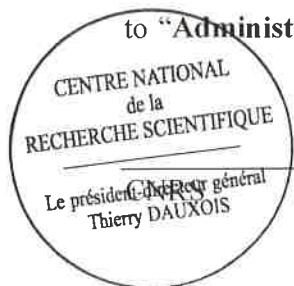
12.1. Ownership of Joint Results

The results, including any information, copyright, patent, technical data or know-how, whether patentable or not which are obtained pursuant to the Agreement, hereinafter referred to as the "Joint Results", are the joint property of the Parties, hereinafter referred to as the "**Joint Owners**", with equal repartition of the ownership shares.

Each Joint Owner retains ownership of the knowledge acquired by it outside this collaboration. Each Joint Owner is entitled to use, free-of-charge, the Joint Results for the sole purposes of its research and for research collaboration with third parties, to the exclusion of any and all other direct and/or indirect use for commercial purposes.

12.2. Appointment of an Administrator Institution for the protection and exploitation of the Joint Results

For each Joint Result, the Parties designate an Administrator Institution (hereinafter referred to as "**Administrator Institution**") to be in charge of the protection and the exploitation of the



Results by taking into account the expertise, the relevance of the intellectual property portfolio already owned by each Party.

If the Joint Results fall within the scope of a key field of expertise of CNRS, as Imagery of life and matter/terahertz, CNRS will assert this expertise to be designated as the Administrator Institution.

The Joint Owners shall, prior to any use of the Joint Results, conclude a co-ownership agreement.

12.3. Protection of the Joint Results by patent

Patent applications are filed in the joint name of the Joint Owners; the name of the inventor(s) shall be mentioned.

The Administrator Institution has an express mandate from the other Joint Owner to manage the filing of copyright or the filing of patent applications (“**Intellectual Property**”) and for obtaining such Intellectual Property protection.

The Administrator Institution assumes responsibility for steering and monitoring the priority Intellectual Property filing procedures, keeps the other Joint Owner informed of the progress of such applications, and provides the list of foreign countries in which extensions shall be filed.

Should any Joint Owner waive entitlement to file or maintain Intellectual Property and/or part of the extensions effective, it shall advise the other Joint Owner, within one (1) month before the end of the industrial property title, so that the other Joint Owner may continue alone the procedure. In addition, the waiving Joint Owner shall undertake to sign or get signed any and all documents enabling the other Joint Owner to become sole owner of the said Intellectual Property, provided, however, that the waiving Joint Owner may retain a non-exclusive license to use the Intellectual Property for noncommercial purposes. The Joint Owner which continues with the procedure shall be the sole beneficiary of any income generated by use of the Intellectual Property in the countries for which the other Joint Owner waived entitlement to continue with the procedure.

The Administrator Institution shall pay the direct expenses incurred for the preparation, filing, extension, registration, grant and/or continuance in force of the jointly owned patents and fees charged by attorneys.

12-4. Exploitation of the Joint Results

The Administrator Institution receives an express mandate from the other Joint Owner to carry out all exploitation-related work. In particular, it negotiates contracts on behalf of the Joint Owners with all companies wishing to exploit the Joint Results.



The Administrator Institution shall keep the other Joint Owner regularly informed of the results of the canvassing or its negotiations. Any licensing agreement shall be signed by Administrator Institution, on behalf of the Joint Owners

The Administrator Institution shall repay to the other Joint Owner a proportion of the royalties resulting from the exploitation of the Joint Result(s) after refunding first the proceedings costs paid by the Administrator Institution and, less a compensation for the exploitation efforts of the Administrator Institution representing twenty per cent (20%) of said royalties. This proportion is based on the equal repartition of the joint ownership pursuant to Article 12.1.

12-5. Software and Databases

Ownership:

- a) Each Party remains sole owner of the software and databases obtained by it outside the framework of the Laboratory or by his own efforts (hereinafter referred as to “Prior software”).
- b) Software created on the basis of Prior software in the context of this Agreement (hereinafter referred as to “Derived software”) and which cannot be parted from the Prior software are the property of the Party owning the Prior software concerned, irrespective of who the author is. Thus where the Party which has made modifications to a Prior software is not the owner of said Prior software, it undertakes to assign exclusively the economic rights over the Derived software as and when they come into being to the Party owning the Prior software for no financial consideration for all countries and for the legal duration of the intellectual property rights. However, if the Derived software are devised by the Party which is not the owner of the Prior software during the performance of this Agreement, the owning Party undertakes to grant to the Party which has developed the Derived software a licence to use said Derived software under terms which will negotiated in a separate agreement in good faith.
- c) The new software and the new databases, which are obtained in common, as well as the Derived software, which can be parted from the Prior Software, are the joint property of the Parties. The Parties have a free and non-assignable right-of-use over this software and databases for the research purposes alone or with third parties. For databases, the right-of-use relates to both the structure and content and includes an extraction right.

12.6. Joint Results infringement actions

In the event of an action for infringement by a third party against the Joint Results, a declaration of invalidity, a claim or infringement of the Joint Results by a third party, the Parties shall act together to jointly agree on the strategy to adopt and shall supply each other with all the evidence in their possession permitting an evaluation of the nature and extent thereof.



They shall act together with regard to the various actions to be taken. They shall in addition exchange all documents, proxies and signatures needed to implement the actions referred to below.

In the event of it not being possible to obtain a consensus, each of the Parties may on its own and at its own expenses take the actions which appear to it appropriate, it being understood that in this event, any compensation resulting from such actions ordered by the court shall wholly and irrevocably be the property of the Party acting.

The Parties not undertaking legal action undertake to provide all the documents, proxies or information necessary to the Party undertaking legal action for the matters referred to above.

Article 13 – Confidentiality

The Parties undertake to ensure that the information exchanged pursuant to the Laboratory and identified as confidential, hereinafter referred to as the “Confidential Information”:

- a) is kept strictly confidential and is protected to the same extent as their own Confidential Information;
- b) is only provided to their seconded staff requiring knowledge thereof and is only used in application of this Agreement, for the duration of this Agreement.

Any and all other communication or use of the Confidential Information is subject to the prior and written authorisation of the communicating Party. Each Party undertakes to ensure that its seconded staff referred to in section b) hereinabove comply with the provisions of this Agreement.

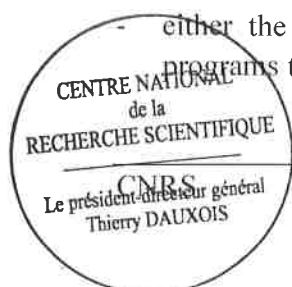
Notwithstanding the foregoing provisions, each Party may provide Confidential Information for which it is able to prove:

- that it was in the public domain prior to its communication or subsequent thereto, but without any breach being attributable to it;
- that it was received legally from a third party;
- that it was already in its possession prior to the execution of the Agreement;
- that it was developed independently and in good faith by its seconded staff who did not have access to said Confidential Information.

Recipient's duty of confidentiality shall survive for five (5) years after the termination of this Agreement.

Moreover, these provisions may not preclude:

- either the obligation binding on all personnel involved in the Laboratory's research programs to provide an activity report to the establishment to which they report, provided



such communication does not represent disclosure within the meaning of industrial property legislation;

- or the defence of the thesis related to the Program of this Agreement, with such defence being organised whenever necessary so as to guarantee the confidentiality of the Joint Results.

Article 14 – Liability

Each Party remains liable, without a right of action against the other Parties, with the exception of cases of gross or intentional negligence, for repairing damage to its own property owing to the performance of this Agreement.

According to the rules of ordinary law, each Party is liable for damage / loss of any nature caused to third parties during the performance of this Agreement.

Article 15 – Importation and Exportation of material

In accordance with its respective national legislation, each Party shall be responsible for the administrative, fiscal and customs procedures necessary for the importation and exportation of equipment and materials used for the implementation of the projects and programs carried out within the framework of this Agreement.

Article 16 – Reporting and Evaluation of the Laboratory

16.1 Reporting

For the CNRS, the Laboratory reports to CNRS Earth & Space.

For the IAC, the Laboratory reports to the Director of the Instituto de Astrofísica de Canarias.

16.2 Evaluation

The Laboratory's work is evaluated according to the effective regulations in force amongst the Parties. On the Spanish side, the operation of the Laboratory will be subject to the rules and procedures of the Spanish State's Regulations.

The Laboratory is also evaluated by the Parties' relevant statutory bodies on the basis of their own rules and procedures.



Article 17 – Dispute Resolution

The Agreement shall be governed by and construed in accordance with the principles of international law.

The Parties shall endeavour to settle their differences out of court in an amicable way.

Should they fail to do so, any disputes may be settled in accordance with the rules of conciliation and the arbitration of the International Chamber of Commerce, under the aegis of one or more arbitrators appointed pursuant to these rules.

Signed in four (4) originals, two (2) in English and two (2) in Spanish, the English version being deemed authentic.



For the Centre National de la Recherche Scientifique

Date : 09 / 07 / 2026



Mr. Thierry DAUXOIS

Chairman – Chief Executive Officer



For the Instituto de Astrofísica de Canarias, IAC

Date : 20 / 07 / 2026

Valentín MARTÍNEZ PILLET

Director



ANNEX 1: 2026-2030 SCIENTIFIC PROGRAM

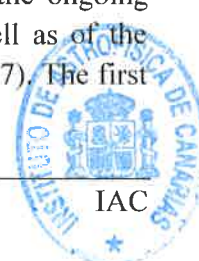
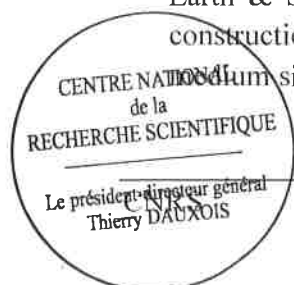
Introduction and context

Since 2021 the CNRS FSLAC International Research Laboratory has become the mothership supporting the scientific and technological French activities in the Canary Islands (Spain), and we expect this role to become more prominent in this second edition. Simultaneously this administrative unit plays a determinant role in fostering and strengthening the scientific collaborations with Spanish researchers, in particular those at Instituto de Astrofísica de Canarias (IAC). This is currently developed along three active scientific themes, soon to become five:

- in gamma-ray astronomy at very high energies around the Cherenkov Telescope Array Observatory (CTAO), a European Research Infrastructure Consortium (ERIC),
- in solar physics with an existing facility, the French telescope THEMIS, and the forthcoming next generation of solar telescopes, EST (ESFRI roadmap 2016),
- in the framework of the Cosmic Microwave Background (CMB) observation with the development of the NIKONA instrument at IRAM and the concept of HYPerspectral KID (HYPKID) technology for the 13-m ngEHT telescope (TEA) planned for the Teide Observatory
- (starting in 2026) In exoplanet research and their associated technological developments such as adaptive optics and high contrast imaging, for the development of the ExoLife telescope within the new LIOM laboratory at IACTEC,
- (starting in 2026) In the field of galactic formation and evolution, to study the formation history and structure of the Milky Way in the context of the exploitation of the WEAVE instrument, a fiber-fed multi-object spectrograph on the William Herschel telescope in La Palma.

These five scientific activities all aim at fostering collaborations between CNRS (CNRS Earth & Space and CNRS Nuclei & Particles), IRFU/CEA and IAC, with the French-Spanish international laboratory as a pivotal axle.

The project of gamma-ray astronomy, CTAO, is being built at two locations, one in the Northern hemisphere and the second in the Southern hemisphere. In each location, several tens of Cherenkov telescopes will be built providing an unprecedented sensitivity, angular resolution and sky coverage in the energy range from a few tens of GeV to one hundred TeV. The Northern hemisphere location is in Roque de los Muchachos at La Palma (Canary Islands, Spain), under the responsibility of IAC. The CNRS Nuclei & Particles and CNRS Earth & Space in close collaboration with IRFU/CEA are contributing to the ongoing construction of the large telescopes (to be completed in early 2026), as well as of the 10-m size telescope of the Northern location (first telescope planned in 2027). The first



prototype of large telescope LST-1 has been operating since 2018 and the first light of the array of four large telescopes will happen in 2026.

In **solar physics**, CNRS Earth & Space and IAC have a long tradition of collaboration that started in 1989 with the joint operation, and scientific exploitation of a pioneer world-wide initiative in a then emerging field: the IRIS (International Research of the Interior of the Sun) helioseismology network (CNRS Earth & Space funded). From this fruitful collaboration derived many sequels, like the space instrument GOLF onboard the the SoHO satellite, follow by the development of the GOLF-NG new generation prototype instrument developed between the CEA and the IAC between 2004 and 2010. More recently the Solar-SONG initiative consisted in feeding solar light to the powerful SONG stellar spectrograph to continue the production of daily helioseismic data. In parallel and since 1998, the exploitation of the CNRS THEMIS solar telescope is shared with Spanish colleagues. Almost every year between 1998 and 2025, several campaigns of solar observations are performed. Since 2006, French and Spanish solar physicists are partners (among other countries) in the proposal of the European Solar Telescope (EST). To prepare this project, CNRS Earth & Space /CNRS was/is one of the partners of three European contracts (EST-DS, SOLARNET and PRE-EST), led by IAC. The FSLAC is the ideal bridge for collaboration and discussion on the participation of FRANCE in EST.

Building on the NIKA2 survey results, the **CMB project** aims now to develop the next generation NIKONA camera which will boost mapping speed by a factor of 100 and enable wide deep surveys. NIKONA will detect low-mass, high-redshift clusters and extend precise mass measurements. The future ngEHT telescope (planned at the Teide Observatory) shall develop TenKID technology instrumentation and will allow an even larger SZ survey of the northern sky. The hyperspectral KID (HYPKID) concept enables highly multiplexed, on-chip spectral measurements for future LIM instruments and is also part of this collaboration proposal.

Regarding the **exoplanet theme**, IAC and CNRS/ CNRS Earth & Space have international scientific recognition in the field of exoplanets and exoplanetary system characterization. IAC is in particular developing a prototype of a new telescope, the Exo-LiFe (ELF) telescope, which aims is to image the surface of exoplanets. Moreover, a new European project called CELESTE (Cutting Edge Leap to Excellence in Space and Optics TEchnologies, 2025-2030) led by IAC, will aim at explore Advanced Optical Systems for the Canarian telescopes which would be useful for exoplanets projects. Through its longstanding technical expertise in adaptive optics, CRAL/CNRS (UMR 5574) is strongly involved in this project. Discussions between CNRS Earth & Space /CNRS and IAC have led to the conclusion that this field of research should be added to the FSLAC agreement for the new five-year plan.

The addition of the **WEAVE spectrograph instrument exploitation** to the FSLAC portfolio of activities stems from the Observatoire de Paris LIRA and the IAC being core partners of the Weave Survey consortium (lead by University of Oxford). To reach the full science impact of the “Gaia for Galactic Archaeology” program, massive ground-based



spectroscopic surveys of faint objects are needed, to complement the on-board Gaia spectroscopic capability: WEAVE has been built to this effect by a wide consortium, including France and IAC; it is currently under final commissioning tests and will be operated by the ING on La Palma. There are very tight science bounds between the French and IAC Galactic communities that are in need of being reinforced to maximize the science benefits of Gaia and WEAVE in the coming 5 to 10 years. FSLAC offers an excellent opportunity for closer ties, with several WEAVE-related researchers interested in visiting FSLAC (medium or long-term) along the lifetime of the WEAVE surveys (expected 2026-2030). Joint PhD projects could also be an excellent mean to reinforce these important topics.

FSLAC Science Axe 1: High-Energy Astrophysics with the Cherenkov Telescope Array (CTA)

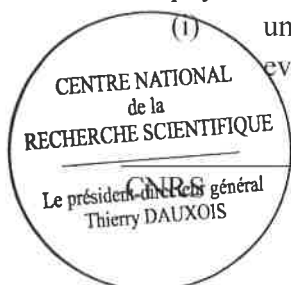
French Leaders: Fabio Acero (FSLAC/ CNRS Earth & Space) & Pierre Cristofari (LUX/ CNRS Earth & Space) & Steve Fegan (LLR/ CNRS Nuclei & Particles) as coordinator CTA-France (Fabio.acero@cea.fr, pierre.cristofari@obspm.fr, sfegan@llr.in2p3.fr), Armand Fiasson armand.fiasson@lapp.in2p3.fr (LAPP/ CNRS Nuclei & Particles), François Brun francois.brun@cea.fr (IRFU/CEA), Andreas Zech (LUX/ CNRS Earth & Space)

Spanish Leaders: Ramon García rgl@iac.es (Instituto de Astrofísica de Canarias, IAC), Mónica Vázquez Acosta monicava@iac.es, Alicia López, Juan Cortina, Josefa Becerra González.

CONTEXT

The Cherenkov Telescope Array Observatory (CTAO) is the next generation ground-based observatory for gamma-ray astronomy at very-high energies. With more than 60 telescopes of three different size classes, CTAO will be the world's largest and most sensitive high-energy gamma-ray observatory. CTAO comprises two sites, one in the northern hemisphere at the Roque de los Muchachos Observatory (ORM) on La Palma, Spain, and one in the southern hemisphere near ESO's Paranal site in Chile, offering full-sky coverage and providing dramatic performance improvements with respect to current ground-based gamma-ray detectors. The CTAO design builds upon the experience gained with the successful current instruments. Covering an energy range from 20 GeV to 300 TeV, CTAO will be the first proposal-driven open observatory of this waveband. Observations will be carried out by observatory operators in service mode. Data will be calibrated, reduced and, together with analysis tools, made available to the user in standard astronomical formats. After a proprietary period, data will be made openly available through the CTAO data archive. Beyond astronomy and astrophysics, anticipated user communities include particle physics, and plasma physics. Key science themes to be addressed by CTAO include:

- (1) understanding the origin of relativistic cosmic particles, and their role in the evolution of star forming systems and galaxies,



- (ii) probing extreme environments such as those around neutron stars and black holes, but also the cosmic voids, and
- (iii) exploring frontiers in physics, including the nature of dark matter.

The prospects for CTAO combine guaranteed science – the in-depth understanding of known source classes and phenomena – with anticipated detection of new classes of gamma-ray emitters and new phenomena, plus a very significant potential for fundamentally new discoveries.

In June 2016, the CTAO Council selected Bologna (Italy) and Zeuthen (Germany) to host the CTAO Headquarters (HQ), and the CTAO Science Data Management Centre (SDMC), respectively. In October 2018, LST-1 (the first Large Size Telescope prototype) was inaugurated in the northern site, allowing to test the first telescope of the CTAO array with first light and gamma-ray detection the year after. In 2022, the final layout of the “alpha” configuration is decided for both the northern and the southern sites. The Northern array consists of four Large-Sized Telescopes (LSTs) and nine Medium-Sized Telescopes (MSTs) while the southern site includes 14 MSTs and 37 Small-Sized Telescopes (SSTs). In 2023, the ASTRONET Science Vision and Infrastructure Roadmap 2022-2035 includes the CTAO as the top-ranked priority amongst new ground-based infrastructure projects.

In 2023-2025, the northern site has seen many developments in the deployment of the remaining LSTs (dish structure, mirror installation and cameras). The full LST array is expected to be completed in mid-2026 and will already be the most sensitive gamma-ray telescope in the 30-300 GeV energy range. In early 2025, the European Commission established CTAO as a European Research Infrastructure Consortium (ERIC) providing CTAO with the legal framework and administrative advantages it needs to be sustainable in its worldwide operations. Concerning the southern site, the first five SSTs and two MSTs are expected to be delivered by 2026. The northern site has 4 LSTs near completion and 1 MST expected in 2027.

In France, 13 CNRS laboratories and 4 CEA services are involved in the development of CTAO. They are: APC, LP2I, CPPM, IJCLab, LAPP, LLR, LPNHE and LUPM (CNRS Nuclei & Particles), GERI, IPAG, IRAP, LIRA and LUX (5 CNRS Earth & Space) and DAp, DPhP, DEDIP and SIS (IRFU). The construction phase of the four LSTs has shown an intense collaboration between CTAO-France (in particular LAPP, CPPM, LPNHE) and IAC members. Now the next important construction step concerns the installation of the MSTs in the northern site and its French NectarCAM camera. The first of the nine MSTs is expected to be installed in late 2026 which will see intense collaboration between the French groups and IAC for the installation and commissioning of the NectarCAM where the FSLAC can play an important role as a platform for French researchers in Canarias.

Furthermore, within the Science Working Groups of the CTAO Consortium, common scientific projects between CTAO-France and IAC members are currently under elaboration, and these projects may either be realised in the context of the CTAO Consortium guaranteed time, the CCI international time or the Spanish time, or as Guest Observer proposals for the open time.



SCIENTIFIC PROJECT



Construction of Large Size Telescopes - Interested laboratories: IAC, LAPP, LPNHE

The construction phase of the four LSTs is now close to completion with an ongoing commissioning of the array of LST telescopes and a first light of stereo shower reconstruction in 2026. This will open the way to start the scientific exploitation of the northern site with its full sensitivity in the 30-300 GeV energy range

Construction of Medium Size Telescopes - Interested laboratories: IAC, APC, CPPM, LP2I, IPAG, IJCLab, IRAP, LAPP, LLR, LPNHE, LUPM, DPhP, DEDIP, SIS

The CTAO alpha array layout foresees the construction of 9 MSTs at the ORM site and 15 MSTs at the Paranal site in Chile. The construction phase starts with the pre-production of the first telescopes, and in this context, a consortium of institutes in France, Spain and Germany is working to install two MSTs in Chile and one in La Palma in 2026-2027 equipped with a French NectarCAM camera. While French laboratories will be responsible for providing the cameras and the mirrors of the telescope, IAC in collaboration with DESY in Germany will be responsible for providing the telescope structure. IAC is also responsible for the local infrastructure. From the French side, one NectarCAM camera is ready to be shipped in 2026 and further are in production. It is therefore planned that French partners will lead the installation and commissioning of the NectarCAM camera both in the South and in the North in the timeframe 2026-2027. For the installation/commissioning phase in the northern site, the FSLAC will serve as an outpost for French labs participating in the installation process.

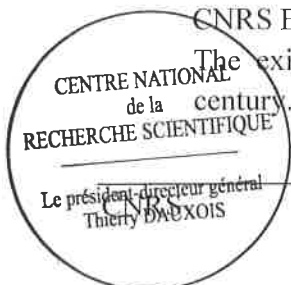
Understanding the non-thermal Universe - Interested laboratories: IAC, all French labs

CTAO will address many major questions in and beyond astrophysics that fall in the area of astrophysics and astroparticle physics and that have as common denominator the understanding of the non-thermal Universe. The science topics that are addressed by CTAO and in which researchers at IAC and in the French laboratories are interested can be classified under three broad themes

Theme 1: Understanding the Origin and Role of Relativistic Cosmic Particles

(staff for the French party: F. Brun, F. Schuessler (IRFU/CEA), F. Cassol, H. Costantini (CPPM/ CNRS Nuclei & Particles), A. Fiasson (LAPP/ CNRS Nuclei & Particles), S. Fegan (LLR/ CNRS Nuclei & Particles), R. Terrier, B. Khelifi, A. Djannati (APC/ CNRS Nuclei & Particles), M. Lemoine (LP2I/ CNRS Nuclei & Particles) G. Henri, B. Cerruti, P.-O. Petrucci (IPAG/ CNRS Earth & Space), P. Cristofari, A. Zech (LUX/ CNRS Earth & Space), L. Tibaldo, P. Martin, Q. Remy (IRAP/ CNRS Earth & Space)

The existence of highly energetic cosmic particles is known since more than one century. In our Galaxy and beyond, the energy density of such particles is comparable



to the energy contained in motions of interstellar gas, and in magnetic fields, implying a tight coupling between these carriers of energy in the cosmos, and a potentially significant impact of energetic cosmic particles on cosmic evolution. Yet a range of basic questions remains open:

- (i) What are the sites of high-energy particle acceleration in the Universe?
- (ii) What are the mechanisms for cosmic particle acceleration?
- (iii) What role do accelerated particles play in feedback on star formation and galaxy evolution?

HE observations can be complemented by ultra-high energy gamma-ray (up to PeV energy) observations from the water Cherenkov detector LHAASO based in China to probe the maximum energy to which particle can be accelerated (PeVatrons). In addition, gamma-ray observations can be complemented as well by direct cosmic-ray data obtained by AMS-02, a highly-efficient mass spectrometer on-board the International Space Station, in which the IAC has a strong involvement.

1. Theme 2: Probing Extreme Environments

(staff for the French party: J. Biteau (IJCLab/ CNRS Nuclei & Particles), JP Lenain, D. Kerzberg (LPNHE/ CNRS Nuclei & Particles), D. Sanchez (LAPP/ CNRS Nuclei & Particles), G. Maurin (LAPP/ CNRS Nuclei & Particles), G. Dubus (IPAG/ CNRS Earth & Space), G. Henri (IPAG/ CNRS Earth & Space), B. Cerruti (IPAG/ CNRS Earth & Space), P.-O. Petrucci (IPAG/ CNRS Earth & Space))

Acceleration of particles to high energy requires environments of extreme energy density that are generally characterised by a complex nonlinear interplay of different forms of energy. VHE gamma rays can be used to explore these environments. Gamma rays are also used to probe the other types of extreme environments, the cosmic voids in the space between galaxies. Specific questions concern:

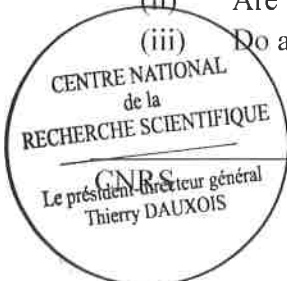
- (i) What physical processes are at work close to neutron stars and black holes?
- (ii) What are the characteristics of relativistic jets, winds and explosions?
- (iii) How intense are radiation fields and magnetic fields in cosmic voids, and how do these evolve over cosmic time?

2. Theme 3: Exploring Frontiers in Fundamental Physics

(staff for the French party E. Moulin, J.-F. Glicenstein, F. Brun (IRFU/CEA); V. Poireau (LAPP/ CNRS Nuclei & Particles), D. Kerzberg (LPNHE/ CNRS Nuclei & Particles))

VHE gamma rays serve to explore questions of fundamental physics, reaching far beyond classical astrophysics studies. Relic particles left over from the Big Bang – such as Dark Matter particles – can potentially be detected in gamma rays. In their billion-year journey from distant extragalactic sources to Earth, gamma rays furthermore probe subtle effects predicted in many theories, but beyond the reach of laboratory experiments. Topics addressed include:

- (i) What is the nature of Dark Matter? How is it distributed?
- (ii) Are there quantum gravitational effects on photon propagation?
- (iii) Do axion-like particles exist?



The availability of other first class optical and IR facilities at the ORM will provide complementarity to CTAO observations: multi-wavelength campaigns, better spatial resolution, follow-up in time and a fast response to target of opportunity events.

FSLAC Science Axe 2: Solar Physics with the THEMIS solar telescope and the EST project

French Leaders (CNRS) Bernard Gelly-bgelly@themis.iac.es, Etienne Pariat-epariat@themis.iac.es

Spanish Leaders (IAC): Marian Martínez González marian@iac.es & Pere Luis Palles lp@iac.es (IAC)

CONTEXT

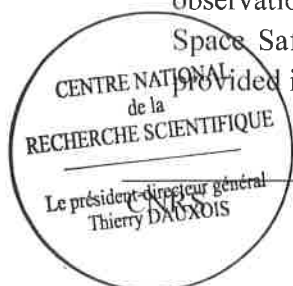
Understanding the Sun has always been a vital quest of astronomy because the Sun is the most significant astronomical object for humankind, and the closest example of a star we have almost within our reach.

Exciting observations of solar magnetic activity from recent space missions, such as SDO, IRIS, Solar Orbiter, PUNCH, have stimulated both scientific interest and social awareness toward the Sun. They have highlighted the ubiquitous role magnetic fields play in determining the nature of the important physical processes structuring the Sun's outer layers and driving solar activity and variability. They have also put new emphasis on the intrinsic relationship between small-scale physical processes and large-scale phenomena (e.g., coronal mass ejections). Getting access to the smaller scales (e.g. below 0.1 arcsec) in the observation of the solar photosphere and chromosphere has triggered the development of the DKIST and EST projects, and the future space mission (SOLAR-C/JAXA, VIGIL/ESA) will run along the same rationale.

Since the early seventies, it has been possible to probe the interior of the Sun through helioseismology. These observations have put strong constraints on the internal structure and dynamics of the Sun, pushing forward the understanding of the physical processes inside the solar evolutionary model as well as the (magnetohydro-)dynamics of the solar interior. The IAC has been a historical partner for France in the seismic study of the Sun and the stars.

Meanwhile, improvements in computational capabilities, physical theory and numerical models are now addressing the fundamental scales in the highly magnetized and turbulent plasma of the solar atmosphere. Both France and IAC have a common expertise on this topic and have collaborated on diverse project at the European level: e.g. IAC-led SOLAIRE (EU-FP6) training network, CEA-led WHOLE SUN ERC synergy grant, ...

Finally, monitoring of space weather induced impact on human assets, driven by solar activity such as solar flares and coronal mass ejections, has become a crucial topic for solar observation and surveillance. THEMIS/FSLAC will be involved in on two projects of the Space Safety program of ESA (ARMAgMap_THEMIS & STEREO-MAG) that aims to provide improved and space-weather oriented data.



Thanks to modern adaptive optics, the current generation of solar telescope (1-2 m class), like THEMIS, can and must still play a fundamental role in the lapse of time that exists between the present and the beginning of exploitation of the next generation of solar telescopes, in:

- bring to fruition the development of the THEMIS adaptive optics (TAO) thanks to the installation and exploitation of the new generation of the italian Interferometric BIdimensional Spectrometer (IBIS 2.0). IBIS2.0 is a dual Fabry-Perot based polarimetric spectroimager, designed and built by a consortium of INAF laboratories. IBIS2.0 is designed to provide high resolution spectropolarimetric images to 0.15", only limited by TAO performances. IBIS2.0 is an excellent addition to THEMIS instrumentation, with huge potential benefits in scientific return,
- Pushing their performances to the limit allowed by their prime mirror size to be challenging partners of the current space instruments, providing fresh science in the current hot topics, and allowing testing of new numerical models. This ensures that the scientific path toward the next generation of telescopes stays updated, and the community at large stays involved in both THEMIS and EST,
- Maintaining and increasing the technical know-how in key technical topics like precision spectropolarimetry, specifically designed solar adaptive optics, and new instrumentation concepts that are all important for the EST technical developments.
- Initiate reflexions on the usage of THEMIS to carry long-term systematic observing program to extend its useful life. Such program shall be strategic and provide original data to be used for space weather applications. The ARMagMap_THEMIS project of the Space Safety program of ESA is a step in this direction, targeting the production of standardized high-resolution magnetic map and magnetic reconstruction of solar activity source.

SCIENTIFIC PROJECT

The (non-exhaustive) list of scientific questions and observing projects in solar physics that are addressed at FSLAC are:

Small-scale structures of the magnetic field in the quiet Sun:

Interested Parties (non-exhaustive list)

- CNRS/ CNRS Earth & Space laboratories and researchers: L. Bigot (LAGRANGE), E. Pariat (FSLAC)
- Identified collaborators at IAC: E. Khomenko, M. Martínez González, F. Moreno
Insertis

The solar atmosphere is a plasma with a highly developed MHD turbulence, leading to the generation of magnetic structures at many spatial scales. Even the best numerical simulations to date (MuRaM, STAGGER-CODE) fall short in describing this structuration



in the Quiet-Sun and its relationships with the local dynamics and velocity fields. At the present, we do not know the actual structuration of this turbulent field. Simulations indicate it may be generated by a local dynamo effect by turbulent velocities, even if the links with large scale fields cannot be ignored at the smaller scales in intergranular areas. From an observational point of view, such a study is better undertaken using spectral lines sensitive to either Zeeman or Hanle effects, or both. Both effects give different information on the small-scale magnetic field, namely, the net flux on the pixel for the Zeeman effects, and the mean magnetic energy for the Hanle effect. The combination of both information can constrain the size of the unresolved structures and the intrinsic value of the magnetic field. In this respect, the observations of the quiet-Sun made at THEMIS in conjunction with 3D numerical simulations carried at IAC represent a great synergy of investigation axis permitted by FSLAC to understand the properties of this fundamental component of the solar magnetism.

Magneto acoustic waves in sunspot umbrae, chromospheric and coronal heating

Interested Parties (non-exhaustive list)

- CNRS/ CNRS Earth & Space laboratories and researchers: T. Corbard (LAGRANGE), B. Gelly (FSLAC),
- Identified collaborators at IAC: E. Khomenko

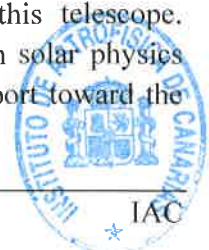
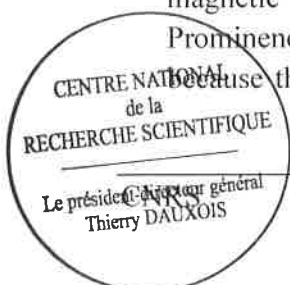
The solar corona is heated by energy originating at photospheric level. While it is hard to say that there is a unique process responsible for this, one of the mechanisms to channel energy is an upward travelling magneto-acoustic wave guided by the magnetic field. The study of such waves at photospheric and chromospheric levels is a key step for the understanding of the coronal heating. Among the past years, we have focused on the presence of phase singularities in such waves. While those singularities are the best way to diagnose the type of travelling wave, they may also play a more important role in its dissipation and this is the driver of our observing program.

Magnetic fields of prominences and filaments

Interested Parties (non-exhaustive list)

- CNRS/ CNRS Earth & Space laboratories and researchers: G. Aulanier (LPP), T. Corbard (LAGRANGE), E. Pariat (FSLAC)
- Identified collaborators at IAC: E. Khomenko

Measuring polarization of the He I line in prominences has been a very strong asset for THEMIS for many years. Through Stokes data inversion, THEMIS produces vector magnetic field maps of prominences which is a unique feature to this telescope. Prominences are important and at the heart of many critical questions in solar physics because they trace the large scale magnetic inversion and the flux transport toward the



poles along the solar cycle, during eruptions they remove and/or redistribute magnetic flux from the surface and so contribute to the polarity inversion of the solar cycle, they structure the coronal magnetic field and shall play a role in the coronal heating either through waves dissipation or magnetic reconnection, and finally, they are responsible for 75% of the coronal mass ejection, providing most of the mass of those phenomena and are a major input for space weather issues. The ESA Space Safety project ARMagMap_THEMIS will target filaments and provide routine high-resolution maps of these regions.

Magnetic driven activity at all scales on the Sun.

Interested Parties (non-exhaustive list):

- CNRS/ CNRS Earth & Space laboratories and researchers: G. Aulanier & Sophie Masson (LPP), A. S. Brun & A. Struggarek (IRFU/CEA), C. Froment (LPC2E), L. Jouve (IRAP), E. Pariat (FSLAC), B. Perri (IAS).
- Identified collaborators at IAC: E. Khomenko, M. Martínez González, F. Moreno Insertis

Solar intermittent events are present at all scale on the Sun, from the large eruptions that induce coronal mass ejection, to confined flares, coronal jets, spicules and coronal bright point. All derive their energy from the intense magnetic field present in the solar atmosphere. In order to predict these events in space weather application, it is necessary to understand the origin of magnetism and determine how this field, which is not created in the atmosphere, is transported from the solar interior. When active regions form, the magnetic field gradually structures itself in the atmosphere. This evolution is slow and continuous relative to the characteristic timescale of active events. While it is now recognized that magnetic reconnection is a central mechanism allowing this energy transformation, the exact nature of the instability/ies triggering eruptive events remains ill-understood. Measuring and characterizing the properties of the magnetic field prior, during and after active events is fundamental to test the conditions, necessary and/or sufficient, for the occurrence of the instabilities that lead to energy release. Understanding the magnetic structuring of the solar atmosphere allows for modeling and simulating these active events. Both French and Spanish solar physics have observational and numerical expertise that can lead to collaboration at FSLAC on, e.g., the emergence of the magnetic field through the solar photosphere, the injection of magnetic flux and energy, the progressive atmospheric storage of magnetic energy and the magnetic structuring of the solar atmosphere, the release of magnetic energy, and its conversion in other energy forms, thanks to magnetic reconnection, and the ejection and acceleration of plasma into interplanetary space. STEREO MAG, a ESA Space Safety project, targets the preparation to the exploitation of the VIGIL space mission, focusing on obtaining more reliable stereoscopic observationally disambiguated magnetic map. In addition, the Agence Nationale de la Recherche funded project “JET2SB”, in collaboration between LPP, LPC2E & FSLAC, will rely on THEMIS observations to provide constraints for the numerical modeling of solar jets, in order to better understand the connection between such events and phenomena observed in the inner

heliosphere by the Parker Solar Probe (PSP) and Solar Orbiter missions, and more generally investigate the acceleration mechanisms of the solar wind.

Better understanding of the internal structure and dynamics of the Sun and stars and the evolution of the solar and stellar rotation and magnetic activity with seismology, spectroscopy, and MHD simulations.

Interested Parties (non-exhaustive list):

- CNRS/ CNRS Earth & Space laboratories and researchers: R.A. García, A.S. Brun & S. Mathis (IRFU/CEA) ; F. Baudin & P. Boumier (IAS), N. Meunier & F. Thévenin (IPAG); J. Ballot & S. Deheuvels (IRAP); L. Bigot, F.X. Schmider & T. Corbard (LAGRANGE)
- Identified collaborators at IAC: Savita Mathur & A. Jiménez

Within the FSLAC, we plan to continue developing the on-going collaborations between IAC/ CNRS Earth & Space /CNRS/CEA in the domain of helio- and astero-seismology and solar MHD simulations. Regarding the Sun, we see as very important to continue checking the two independent claimed detections of gravity modes in the Sun (2007, 2017) leading to the common conclusion that the solar core is rotating several times faster than the envelope. This has revived the interest of the community for both modelling of the solar structure and of the internal rotation, while continuing to monitor solar oscillations on the long term. Since the summer of 2018, the Solar-SONG instrument provides daily data that can be used to study the propagation of the oscillation modes and convection processes at different heights in the solar atmosphere. These observations may be confronted to synthetic data obtained with 3D magneto-hydrodynamical simulations (STAGGER CODE) coupled to 3D line transfer code, both developed at OCA. The FSLAC provides the optimal framework to share students and post-docs between the institutions of both countries. The WHOLE SUN ERC synergy project holds until 2026 and is a large theoretical and numerical effort to understand how the Sun generates its magnetic field and how that field emerges and erupts. Several shared postdocs and PhD students have already benefitted from this program.

Regarding asteroseismology, stellar oscillations data program of the current TESS and later PLATO space missions are exploited to address questions of interaction of stellar dynamo, stellar rotation and the formation of stellar magnetic fields. Special attention is given to the study of the evolution of the surface rotation and magnetic activity, as well as the solar/stellar dynamos in connection with the ERC “WHOLE SUN” and ERCAdV project SPIDI (Star-Planet-Inner Disk Interactions). Seismology can also be applied to giant planets of the solar system and provides unique information about the internal structure of the planets, giving clues to the origin and physics of the solar system.

Space Weather activity on inner planets of the solar system, in particular



Interested Parties (non-exhaustive list):

- F. Leblanc (CNRS-IPSL) J.Y Chaufray (CNRS-IPSL)
- Valeria Mangano (INAF-IAPS)

Since the 80', Mercury is known to have a surface boundary exosphere, or a volume surrounding the planet regolith that contains molecules with a weak gravitational coupling, slowly merging into space. This exosphere contains several chemicals, among them the most observed from Earth are the sodium and potassium species. That abundances of these two species undergo a strong variability by orders of magnitude depending on the solar wind conditions. Thanks to THEMIS observations, the relationship between the surface of Mercury and the interplanetary medium through the solar wind particles and radiation, the internal and interplanetary magnetic field is now believed to be the main driver of this observed exospheric variability, but the role of the many processes involved is still under discussion.

THEMIS is one of the two telescopes of the world suited to observe Mercury during daytime and able to provide several hours of uninterrupted observations, a feature that no other night-time telescope can offer. THEMIS exceptional coverage allowed to sample the exosphere in many orbital configurations. In the framework of the arrival in orbit of the Bepi Colombo mission, THEMIS appears as particularly relevant for ground-based support observations.

The European Solar Telescope

Interested Parties (non-exhaustive list):

- CNRS/ CNRS Earth & Space laboratories and researchers: G. Aulanier & Sophie Masson (LPP), L. Bigot & T. Corbard (LAGRANGE), C. Froment (LPC2E), A. S. Brun & A. Struggarek (IRFU/CEA), V. Reville, L. Jouve (IRAP), B. Gelly & E. Pariat (FSLAC), E. Buchlin & B. Perri (IAS).
- Identified collaborators at IAC: M. Collados, E. Khomenko, M. Martínez González, F. Moreno Insertis, H. Socas Navaro, the EST foundation

The European Solar Telescope project (EST; <https://est-east.eu/>) is the main solar ground-based instrumentation and observation project and a priority at European level (Astronet). It is a new generation 4.2m solar telescope project, currently led by a strong team of IAC engineers and scientists, and to be located at La Palma/Roque de Los Muchachos Observatory. Before the IRL and since 2009, the THEMIS team has actively contributed in the EST project, in participating in the EST Design Study and in the two successive editions of the SolarNet I3 initiative (<http://research.iac.es/proyecto/solarnet/>), THEMIS being one of the "pathfinder" infrastructures of the EST project.

At the level of the French solar community (CNRS Earth & Space PN ASTRO/ATST) a new interest has been expressed for participation in EST, in particular for the scientific exploitation of its data that will be provided by the telescope in "science ready" format. Due to FSLAC's location in direct connection with the IAC and the EST teams, FSLAC appears



as the spearhead for discussion and collaboration on EST, which remains the single and major project of European ground-based solar physics.

FSLAC Science Axe 3: Measure of the cosmic microwave background (CMB) spectral distortions and galaxy clusters with QUIJOTE and the TEA telescope

French Leaders: Nicolas Ponthieu (Institut de Planétologie et d'Astrophysique de Grenoble, IPAG/ CNRS Earth & Space), Guilaine Lagache (LAM/ CNRS Earth & Space), Bruno Maffei (IAS/ CNRS Earth & Space), Juan Macias Perez (LSC/ CNRS Nuclei & Particles), Alessandro Monfardini (INP)

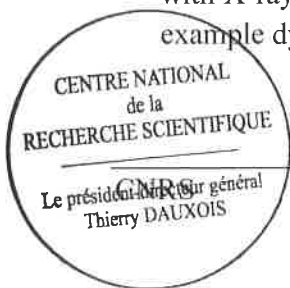
Spanish Leader: J.-A. Rubiño-Martín (IAC)

Staff involved: F.-X. Désert (IPAG), N. Aghanim (IAS), M. Bouzit (IAS), A. Chappard (IAS), A. Beelen (LAM), M. Bethermin (ObAs), A. Benoît (Institut Néel), M. Calvo (Institut Néel), J. Bounmy (LPSC), O. Bourrion (LPSC), A. Catalano (LPSC), A. Fasano (IAC), R. T. Génova-Santos (IAC), R.J. Hoyland (IAC)

This long-standing collaboration stems from the Planck satellite project. Our collaboration benefits from the strong synergy between the French and Spanish groups in terms of scientific interests, technological developments and expertise. In the past 5 to 10 years, after Planck, we have been collaborating on various aspects of millimetre cosmology. We here give a brief overview of the most emblematic ones and how we plan to keep working on them in the near future.

Cosmology from galaxy clusters via the Sunyaev-Zeldovich effect

The SZ effect (Sunyaev-Zeldovich 1970) is a CMB spectral distortion generated by the inverse Compton scattering of CMB photons off hot electrons. The most common application of the SZ effect is the detection of galaxy clusters (GC), which can be used as a powerful cosmological probe (e.g. Carlstrom et al, 2002; Rubiño-Martín & Sunyaev 2003; Planck collaboration XX, XXI & XXIV 2013, Planck collaboration 2015). GC are excellent cosmological probes capable of setting constraints on cosmological parameters such as the normalization of the matter power spectrum (σ_8), the dark matter and dark energy densities (Ω_m et Ω_Λ), the neutrino masses and the equation of state of dark energy. With Planck, ACT and SPT, hundreds of clusters have been observed, but the cosmological constraints remain hampered by the need of high resolution observations to obtain reliable cluster mass estimates. This is the main purpose of the NIKA2 Large Program SZ. This program has demonstrated the power of high resolution instruments to accurately measure hydrostatic cluster masses (e.g. Muñoz-Echeverría et al, 2024) by combining the tSZ measurements with X-ray data. Furthermore, these masses can be compared with other estimates like for example dynamic ones obtained by the IAC team (Aguado-Barahona, A., et al. 2022).

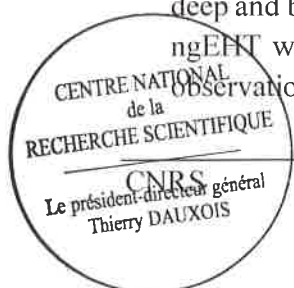


Although very successful the NIKA2 LPSZ program was focused on less than 50 clusters scattered across the sky. To increase this statistic, we have several options. First, we plan to upgrade the IRAM 30m NIKA2 instrument with a specifically designed tSZ camera (4 spectral bands): NIKONA. This camera will improve by a factor of 100 the current NIKA2 mapping speed enabling a deep sky survey (about 100 deg² on 4000 hours of observation). This survey can be used to detect low mass and high redshift clusters of galaxies (Cherouvrier et al 2025). Furthermore, NIKONA, could be used also to expand the LPSZ cluster mass estimation to a much larger number of clusters and to a larger range in mass and redshift. TEA (the 13-meter next-generation Event Horizon Telescope, ngEHT) planned for the Teide observatory offers another complementary opportunity. Building on our expertise and fruitful collaboration with IAC, our goal is to provide new, cutting-edge instrumentation for this telescope: TenKID. This instrument will build on our expertise with NIKA2 and NIKONA. Our goal is to perform an even larger survey (5000 deg²) of the Northern sky focusing on the detection of clusters of galaxies via the SZ effect and the construction of a cluster sample for cosmology complemented with NIKONA data.

Dusty Star forming galaxies

Despite recent progress, the contribution of Dusty Star Forming Galaxies (DSFG) to the young Universe ($z > 4$) remains uncertain. Recent ALMA surveys showed that dust obscured (far-IR, mm) and unobscured (UV rest-frame) star formation could have a similar contribution to the cosmic budget even at $z \sim 6$, which was recently supported by new JWST data. Yet, these studies are not based on volume complete surveys and/or rely on complex corrections and selections. Accurately quantifying the total density of the star formation rate at $z > 4$ from a well controlled volume-limited survey remains a necessary and ambitious goal. To this end, single dish millimeter surveys are mandatory. The NIKA2 Cosmological Legacy Survey (N2CLS, PIs: Lagache, Ponthieu, Beelen) is one of them. It is the deepest and largest survey at 1.2 and 2mm. For about 300h, our team has deeply integrated two fields with a wealth of ancillary data: GOODS-North and COSMOS. Thanks to NIKA2 exquisite sensitivity, we have mapped GOODS-North down to the confusion limit (Ponthieu et al, 2025) and detected more than 100 DSFGs in total (Bing et al, 2023; Berta et al, 2025; Béthermin et al, 2025). At 1.2 mm, the number count measurement probes consistently 1.5 orders of magnitude in flux density, covering the full flux density range from previous single-dish surveys and going a factor of 2 deeper into the sub-mJy regime. Our measurement connects the bright single-dish to the deep interferometric number counts. At 2 mm, we match the depth of the deepest interferometric number counts and extend a factor of 2 above the brightest constraints. This enabled us to give for the first time an estimate of the dust mass comoving density up to $z \sim 7$, i.e. when the Universe was less than 1 Gyr old.

To extend these results and further elucidate the early stages of galaxy evolution, new large, deep and blind surveys are required. Equipping the IRAM 30m with NIKONA, and/or then ngEHT with TenKID are natural projects to fulfill this need. With our expertise on the observation and analysis of these surveys, together with our collaboration to state of the art



models (SIDES: Bethermin et al 2017), our team remains at the forefront of this sector of cosmology.

Line Intensity Mapping

Spectral Line Intensity Mapping (LIM) is an innovative cosmological observation technique that aims to study the large-scale structure of the Universe and the evolution of galaxies over cosmic time. Unlike traditional surveys that seek to detect each galaxy individually, LIM measures the integrated emission of entire populations of unresolved galaxies in a given spectral line (such as the 21 cm HI line, CO molecular lines, or the fine structure line [CII]). By mapping this emission in three dimensions—two in the sky and one in frequency (or redshift)—we can reconstruct the distribution of luminous matter, and thus indirectly that of dark matter, throughout cosmic time. This approach makes it possible to efficiently explore immense volumes of the Universe and extract statistical information about galaxy formation, cosmic reionization, and large-scale structure, opening a new window of observation that complements conventional optical and radio surveys.

The CONCERTO experiment, installed on the APEX telescope, paved the way for this new generation of observations, following on from its pathfinder KISS installed on the Tenerife IAC QUIJOTE telescope. CONCERTO is currently the only experiment to have carried out a large-scale [CII] survey, covering 1.4 square degrees between July 2021 and December 2022, and has also been used for other purposes (e.g., Désert et al., 2025, A&A, 701, 210). With its innovative approach and unprecedented sensitivity in the submillimeter range, CONCERTO stands out as a pioneering LIM experiment. Drawing on the experience of the technological challenges encountered with our pioneering CONCERTO instrument, we are able to anticipate, probably better than other groups, the requirements for the next generation of LIM instrumentation. It is clear that we must seek to maximize the observation capacity (“throughput”) of our future instruments without disproportionately increasing their size. In 2023, we therefore began exploring a new concept, which we have named *HYPerspectral KID* (HYPKID). In this case, the medium-resolution spectra ($R = 100\text{--}1000$) required for LIM are acquired directly on-chip, and the incident radiation is guided to the filters via a large array of cylindrical horns. HYPKID is perfectly suited to an extremely high number of beams, even in the tens of thousands, as we anticipate for the next 3 to 5 years. Since the first prototype operating at 90 GHz that we built and tested in 2023 (U. Chowdhury et al, 2023), we have developed new devices operating at 150 GHz and 240 GHz. With a view to even greater efficiency and resilience, we are also studying an alternative version that eliminates horn antennas and uses HYPKID filled arrays (E. Prêle et al., 3D electromagnetic simulations in progress). An instrument using this technology is an excellent concept for equipping the ngEHT planned for the Teide Observatory.

CMB polarized anisotropies

The Cosmic Microwave Background (CMB) is the most emblematic cosmological signal. Predicted by Gamow et al (1948) and detected by Penzias & Wilson (1965), it is the second strongest piece of evidence for the Big Bang, after expansion. It is the best evidence for the

overall homogeneity of the universe to first order and, at the same time, a direct image of the seeds of large-scale structures. Through detailed analysis of the temperature and polarization anisotropies of the CMB, together with complementary surveys, the Planck satellite has been able to constrain the key parameters of Λ CDM to percent-level precision (Planck coll. 2020). Despite this success, Λ CDM faces persistent challenges, some of which, such as the characterization of Inflation can only be addressed by more observations of the CMB polarized anisotropies (and spectral distortions, see below).

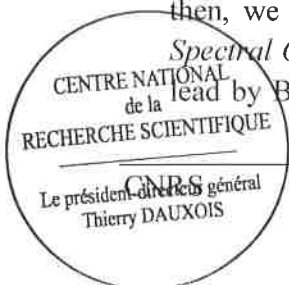
On that front our CNRS-IAC collaboration has been maintained after Planck. IAS in particular is involved in the LiteBIRD satellite project and has been interacting with IAC in this context. Both institutes are working on the instrument concept and on the calibration plan.

The Tenerife observatory is part of the international quest for the polarization B modes and coordinates with in particular the Simons Observatory. As far as ground based observations are concerned, our groups have put an ERC Synergy proposal in November 2025, the *Kid Array Instrument to Reveal the Origin of the Structures* (KAIIROS) to build a high frequency small aperture telescope based on KID detectors for the Simons Observatory. An extension of our collaboration with IAC to this project would be natural. In the same line of thought, we are thinking of proposing a polarized version of NIKONA or TenKID. This instrument would benefit from both the experience acquired on NIKA2 and from on-going R&D in Grenoble (Savorgnano et al, 2025).

CMB Spectral distortions

Since the COBE/FIRAS mission, the cosmic microwave background (CMB) spectrum has been known to be a quasi-perfect blackbody. However, standard and non-standard physical processes inevitably lead to two main types of spectral distortion: the μ distortion, which is imprinted at $z > 5 \times 10^4$, and the Compton y distortion, which originates from lower redshifts. Spectral distortions arise from different physical mechanisms at small scales and are a sign of both new physics and baryonic effects. Y distortions arise from processes such as the reionization of the universe or interactions with hot gas in galaxy clusters. μ distortions, on the other hand, can signal physics beyond the standard model, such as early energy injection by decaying relic particles, primordial black holes, or dark matter interactions, in addition to constraining inflation on scales inaccessible to CMB anisotropies. Measuring CMB spectral distortions would provide new and unique insight into these topics.

On October 7th 2025, ESA selected the *FTS for CMB Spectral distortion expLoration* (FOSSIL), a M class satellite mission lead by N. Aghanim and in which all our labs are involved. This mission is the long-term flagship experiment of this area of research. Until then, we are actively working on other projects. First, the *Balloon Interferometer for Spectral Observation of the Universe* (BISOU), the balloon borne pathfinder to FOSSIL, lead by B. Maffei (IAS). It involves the same teams and is currently in CNES phase A.



Second, the *Tenerife Microwave Spectrometer* (TMS, Jose-Alberto Rubiño-Martin et al, 2020), aims to build a novel spectrometer operating from the ground at Teide observatory. It is remarkable that all our groups are collaborating on these three projects that exploit all possible observation conditions (ground, balloon, satellite) available to millimetre astronomy. As another example of our concrete collaboration, we have begun co-supervising Ph.D. students, including Apolline Chappard (under the supervision of Maffei and Rubiño-Martin, with a defence scheduled for early 2026). A mechanical engineer (Mehdi Bouzit) from IAS, spending long periods at the IAC over the last few years is working on the Tenerife instrument TMS. Additionally, IAS and IAC have submitted a common ERC Synergy proposal, CMBFRONTIER, for the November 5th, 2025, call.

FSLAC Science Axe 4: From exoplanetary systems characterization to developing dedicated instrumentation and technologies

French Leaders: Maud Langlois (CRAL/ CNRS Earth & Space, co-PI PEPR origins, French responsible for CELESTE), Gil Moretto (CRAL/ CNRS Earth & Space, Lead for FlexSiMirror and Live Mirror projects)

Spanish leaders: Rafael Rebolo (IAC), Nicolas Lodieu (IAC), Iciar Montilla (IAC)

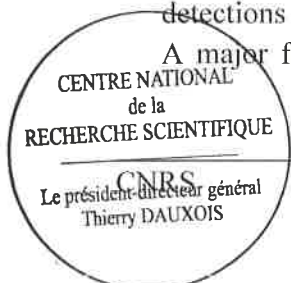
Staff involved: Michel Tallon (CRAL/ CNRS Earth & Space), Olivier Flasseur (CRAL/ CNRS Earth & Space), Eric Thiébaud (CRAL/ CNRS Earth & Space), Xavier Delfosse (IPAG/ CNRS Earth & Space, representing the NIRPS consortium), Magali Deleuil (LAM/ CNRS Earth & Space, representing the PLATO consortium which involves more than 100 French participants from various institutes), Alexis Carloti (IPAG/ CNRS Earth & Space, representing the HARMONI-HC team)

Exoplanetary Science and Collaborative Expertise

In the past five years, over 1,100 new exoplanets have been confirmed, raising the total to more than 5,600 across 4,000 systems. This rapid growth now enables large-scale statistical studies of planetary architectures and more detailed investigations of individual systems to understand their physical mechanisms, evolution, and formation. Advances in characterization techniques for both giant planets and super-Earths have opened the way to comparative planetology, allowing us to probe the diversity of planetary systems and assess how unique the Solar System's structure may be. Key questions driving the field include identifying the mechanisms shaping planetary system architectures, the frequency of exomoons and long-period planets, and determining the best targets for atmospheric characterization with instruments such as JWST and the ELT.

The CNRS–IAC collaboration has strong potential in exoplanet instrumentation and detection techniques, combining high-angular and spectral resolution imaging for direct detections with indirect methods such as radial velocity, transit photometry, and astrometry.

A major focus lies in signal processing and data extraction, increasingly supported by



machine learning and AI, which are essential for analyzing the vast multimodal datasets from current and upcoming surveys. Instrumental developments aim to extend observational capabilities toward higher spatial and spectral resolution, enabling detailed spectral studies of terrestrial planets in habitable zones. Ongoing innovation within the PEPR ORIGINS (CNRS) initiative and the IAC–CNRS CELESTE partnership reflects this shared commitment to advancing next-generation exoplanet detection and characterization.

1. Extreme adaptive optics and high contrast imaging

In Extreme adaptive optics for exoplanets The French community is undoubtedly one of the most involved in the construction of adaptive optics for the first ELT instruments In particular, on HARMONI, MICADO (PI MPE with strong contribution from LESIA, GEPI, UTINAM, Charles Fabry Laboratory and Institut de Physique des 2 infinis) and to a lesser extent MORFEO (PI INAF with participation of IPAG), ANDES and METIS (PI Leiden University with participation of the CEA). These developments have also benefited from detailed studies on the performance of VLT/SPHERE's adaptive optics that will be further improved as part of the SPHERE+ project (PI LIRA/CNRS) which is part of the ELT PCS roadmap to understand current limitations in high contrast imaging. This project is a technological demonstration for the construction of an equivalent of SPHERE for the ELT and aims to demonstrate some of these technologies (use of a GPU-assisted RTC, new control algorithms, addition of a second loop with a pyramid analyzer and correction of NCPAs). As part of the PEPR Origins, several work packages are directly focus on these research topics (new wavefront sensors, new deformable mirrors and GPU-assisted real-time computers). In. addition the cophasing of large, segmented mirrors is also a research topic of the PEPR origins and of a submitted INFRATEC proposal by CNRS called EXOSHARE including IAC.

2. Coronagraphy

One of the major results is the result of the first space coronagraphs on the JWST, the MIRI and NIRCAM instruments. In particular, we can mention the four-quadrant type coronagraphs developed at LESIA (Boccaletti et al., 2022), which made it possible to take the first image of an exoplanet in the infrared (Carter et al., 2023). However, the performance of space or ground-based coronagraphs is currently limited by optical aberrations, due to atmospheric aberrations residues, the quality of the optics or discontinuities in the pupil of the telescope (secondary mount, segmentation). These aberrations create remnants of starlight in the focal plane, called scabs or speckles, which limit the level of contrast and obscure the planets. To reduce these aberrations, It is necessary to use correction loops directly using the science detector, to obtain an area of very high contrast where the speckles are corrected, called Dark-Hole. In 2022, for the first time, the technique of this type made a Dark-Hole directly on an instrument on the sky, on

SPHERE (Potier et al., 2022). This kind of technique will be at the heart of the wavefront control algorithms used on the SAXO+ for the SPHERE instrument.

3. High-resolution spectroscopy for exoplanets

In the field of very high spectral resolution for the detection of exoplanets at radial velocity, it is worth noting the strong involvement of the French community in one instrument in particular, SPIROU and to a lesser extent in the NIRPS instruments, ESPRESSO, CARMENES, GIANO. This generation of instrument has made it possible to enormously extend the performance in high spectral resolution, in combination with adaptive optics. This experience is now being used in the development of the second-generation ELT instrument ANDES which has completed its phase A, and is approaching the end of phase B, and which involves several French and Spanish teams. One of the outstanding results of the last five years is the combination of high angular resolution and spectral resolution. This combination of Integral Field Spectrograph (IFS) coupled with adaptive optics (VLT/SINFONI, VLT/MUSE, Keck/Osiris, VLTI/ Gravity) from the ground or in space (JWST/MIRI/MRS) allowed the characterization of several planets and the detection of PDS 70c and Beta Pictoris c. To detect the planetary signal with these non-coronagraphic instruments, new detection algorithms have been developed, taking advantage of spectral resolution and making assumptions about the molecular composition of planets, called molecular mapping.

4. Space missions:

Finally, the French and Spanish communities are particularly involved in ESA's next two 'exoplanet' missions. Transits and Oscillations of stars will allow the detection of terrestrial exoplanets orbiting Sun-like stars in the habitable zone. PLATO, which will be launched in 2026, is currently integrated into ESTEC. The Ariel mission, on the other hand, will allow a statistical study and large-scale characterization of exoplanet atmospheres, including their chemical composition, through the observation of more than a thousand targets.

5. The French collaborations on Origins and life

The French community obtained funding from the exploratory PEPR "Origins" (≈ 50 M€, structuring dozens of laboratories) to address the instrumental and data processing challenges in high contrast imaging. Finally, it is worth mentioning the recent creation of the CNRS défi "Life in the Universe", which will make it possible to structure much larger communities by including the institutes and themes of chemistry, biology, data science, engineering.



Emerging scientific questions and collaborations

We present here a non-exhaustive list of scientific questions and projects that would benefit from a joint undertaking within the FSLAC framework by Spanish and French teams that have both many years of experience on these research topics.

One of the particularly interesting questions at the moment is the combination of several techniques (radial velocities + interferometry or high contrast imaging) to observe the same objects, which was reserved for radial velocities and transits. Advances in high angular resolution (interferometry, adaptive optics, coronagraphy) and future DRs of Gaia should make it possible to extend these multi-instrumental studies to many other objects. Emerging technologies in photonics are beginning to be used in our field, in particular with optical circuits based on substrates intended for use in the visible and mid-infrared domains, namely for adaptive optics or interferometry. In the field of high-contrast instrumentation, the next five years should see the completion of the first-generation ELT instruments. At the same time, the PCS (Planetary Camera and Spectrograph) instrument, a second-generation ELT instrument dedicated to visible exoplanet imaging, has started the roadmap studies involving the CNRS on several aspects (adaptive optics, instrumentation, scientific cases and yield, deformable mirror, coronagraphy, etc.).

In parallel, for future space-based facilities, a program for the maturation of large observatories (GOMAP) is underway in the United States in partnership with CNES over this decade, in order to detail the scientific objectives of the habitable worlds observatory (HWO), including a maturation of the technologies that will make them achievable. At the same time, part of the French community is organizing itself around the LIFE mission (Quanz et al., 2022), a large European interferometric mission project for the detection of exoplanets in the habitable zone. These two complementary missions, LIFE in the thermal infrared, and HWO in the visible, would allow a complete characterization of planets in the habitable zones of nearby stars. Following their significant involvement in space missions and on the ELT, the French and Spanish laboratories shall carry out technological maturation work in instrumentation if they wish to be involved in these future instruments. A collaboration between the IAC, the CNRS and ESA funded by Europe (CELESTE project) is underway and will continue over the next 4 years. The establishment of the IRL FSLAC will promote the development of these collaborations for both space and ground based applications.

1. Data science

On the data science side, the hyperspectral instruments under development to access exoTerrestrials and biosignatures in the future require the development of new methods of data analysis and instrument modeling, which are based on their multimodality. The optimal extraction of the information from these instruments requires considering multivariate joint algorithms and algorithms capable of operating on heterogeneous or "multi-modal" data. In a context of large masses of data processed statistically and in particular by AI, it can be noticed that an increasingly critical attention is focused on the aspects of false alarms, uncertainties, characterization of information a posteriori and explainability of results. An

example is the detection of exoplanets by radial velocities, where perturbative phenomena of stellar origin are now the limiting factors, ahead of instrumental noise that has been reduced to extremely low levels. In this case, a coupling will probably be necessary between the consideration of the physics of these processes related to stellar activity and neural network learning algorithms to push back the current detection limits.

2. ANDES

ANDES will be installed on ESO's Extremely Large Telescope (ELT) and will be used to search for signs of life in exoplanets among other science cases. Formerly known as HIRES, ANDES is a powerful spectrograph. The instrument will have a record-high wavelength precision in the visible and near-infrared wavelengths. One of ANDES science case focus on potentially detecting signatures of life in other worlds by conducting detailed surveys of the atmospheres of Earth-like exoplanets.

3. HARMONI

HARMONI is conceived as a workhorse instrument, addressing many of the key ELT science cases. It will exploit the ELT's scientific niche in its early years. At close-to-diffraction limited scales, it will capitalize on the sensitivity gains of the E-ELT, providing unprecedented improvements in sensitivity and spatial resolution. HARMONI has a dedicated high contrast mode which will allow unprecedented discoveries on exoplanets. HARMONI will have a high complementarity with ALMA and JWST, with similar angular resolution to the former and comparable sensitivity to the latter. The CNRS and the Instituto de Astrofísica de Canarias (IAC) have been actively participating during its conceptual design as part of an International Consortium led by the University of Oxford (PI). HARMONI represents a unique scientific opportunity for the French and Spanish astronomical community, allowing the access to the ELT soon after the start of operation via the guaranteed time. It also permits to the French and Spanish technological centers and industries to participate in the development of this advanced instrument. IAC and CNRS collaborations will be key to maximize the HARMONI science yield in the exoplanets field.

4. CELESTE & SELF

The aim of the CELESTE (PI R. Rebolo) project focus on technological development in the space and optics fields with this aim it is receiving support from two leading institutions: the National Centre for Scientific Research of France (CNRS) and the European Space Agency (ESA). The Instituto de Astrofísica de Canarias (IAC) is also hosting an ERA Chair on optics and photonics technologies. It consists of a group of experimental physicists and astronomers, engineers, and technicians dedicated to developing an innovative optics and photonics technology targeting exoplanetary sciences. The main objective is to build new capacities at the IAC, to develop new optical and tensegrity technologies to incorporate into the next generation of telescopes, such as the ExoLife Finder (ELF) telescope, aimed at high-contrast imaging of exoplanets around very bright stars to enable the search for signs

of life. The CNRS is closely collaborating to this project in the framework of PEPR Origins in particular on extreme adaptive optics system and the scientific exploitation, and also in the framework of the EIC live mirror project for the lightweight active mirrors developments. IAC is engaged in building a technology demonstrator: the Small-ELF telescope which is part of the IACTEC "Large Telescopes" together with the Cherenkov Telescope Array, the European Solar Telescope and the New Robotic Telescope. Further proof of concepts related to adaptive optics and cophasing are also foreseen in collaboration with CNRS using the 10-meter Gran Telescopio Canarias (GTC) in collaboration with IACTEC. This facility is a unique joint opportunity to raise TRL of new technology for high contrast imaging with giant telescopes.

In conclusion the complementary skills of CNRS and IAC in the domain of exoplanets research, instrumentation, telescope facilities, technological R&D, and science data will be boosted by the FSLAC collaboration.

FSLAC Science Axe 5: Galactic Archaeology with WEAVE and Gaia

French leaders: Vanessa Hill (LAGRANGE/ CNRS Earth & Space), Piercarlo Bonifacio (LIRA/ CNRS Earth & Space)

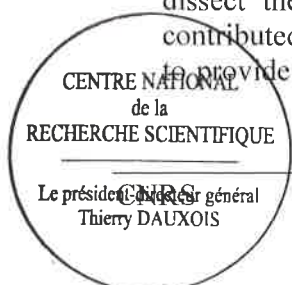
Spanish leaders: Jonay Gonzalez Hernandez (IAC), José Alfonso Lopez Aguerri (IAC)

Staff involved:

- CNRS/ CNRS Earth & Space laboratories and researchers:
Observatoire Astronomique de Strasbourg (ObAS): B. Famaey, R. Ibata, N. Martin, A. Siebert - Observatoire de Paris, laboratoire LIRA (OP/LIRA) P. Bonifacio, E. Caffau, P. Francois, F. Royer, M. Spite. - Observatoire de la Côte d'Azur (OCA) : P. de Laverny, V. Hill, G. Kordopatis, A. Recio-Blanco, M. Schultheis. - Laboratoire d'Astrophysique de Bordeaux (LAB) : C. Soubiran. - Institut de Planetologie et d'Astrophysique de Grenoble (IPAG) C. Babusiaux. - Laboratoire d'Astrophysique de Marseille (LAM) : M. Pieri
- Identified collaborators at IAC :
D. Aguado, C. Allende Prieto, G. Battaglia, C. del Burgo Díaz, E. Fernández-Alvar, C. Gallart, J. Gonzalez Hernandez, C. Hernandez-Monteagudo, J. A. Lopez Aguerri, G. Thomas

1 Context

Our understanding of the structure and evolution of the Milky-Way is now undergoing a revolution, thanks to the European Space Agency Gaia mission (Gaia collaboration et al. 2016). For the first time we are able to combine dynamical (full phase space data that can be used to compute integrals of motion and Galactic orbits) and chemical information to dissect the various Galactic populations and understand their history and how they contributed to the assembly of the Milky Way. For stars that are too faint for the Gaia RVS to provide line of sight velocities or chemistry, complementary ground-based spectra are



needed to complement the superb Gaia proper motions and parallaxes. WEAVE is the angular stone for this ground based complementary large-scale spectroscopic surveys in the Northern hemisphere, and it is thus germane that all efforts should be employed to maximise its outcome. The French-IAC scientific collaborations described in this document are at the core of this revolution, including activities aiming to produce future Gaia data releases, the operations and analysis of the WEAVE ground-based observational efforts to complement Gaia with spectroscopic data of faint stars, and different science cases to interpret the obtained data in the framework of Milky Way's evolution.

2 The WEAVE facility

To reach the full science impact of Gaia for Galactic Archaeology, massive ground-based spectroscopic surveys are needed, to complement the on-board Gaia spectroscopic instrument for the faint end of the catalogue, namely line-of sight velocities for objects with $G < 15 - 16$, and full spectroscopic chemical characterization for those with $G < 12 - 13$. WEAVE has been built by a wide consortium, including CNRS/ CNRS Earth & Space (French PI: P. Bonifacio) and IAC (Spanish PI A. López Aguerra), as well as the Isaac Newton Group (ING) that is both part of the instrument consortium and will operate the instrument. The 'WEAVE Survey' takes 70% of the observing time. WEAVE surveys include a Galactic Archaeology survey (that itself amounts $\sim 60\%$ of the WEAVE surveys fibre.hours), led by a CNRS/ CNRS Earth & Space "Science Team Lead" (STL), that will provide metallicities to the limiting magnitude for ~ 3 million stars and detailed abundances for ~ 1.5 million brighter field and open-cluster stars. Two of the other WEAVE surveys are lead by STLs at IAC (a survey of galaxy clusters, and a survey of nearby galaxies complementing the APERTIF radio observations), and another survey is led by a CNRS/CNRS Earth & Space STL (a survey of high-redshift quasars). Beyond the operations of the WEAVE surveys (Sec. 2.1), there are very tight science bounds between the French and IAC Galactic communities, that are in need of being reinforced even more to maximise the science benefits of WEAVE in the coming 5 to 10 years.

Running the WEAVE surveys

Within WEAVE, the Galactic Archaeology science team for WEAVE is led by a French "Science Team Lead" (V. Hill) and co-led by G. Battaglia from the IAC. The French and IAC communities also supports the Quality Assessment (QAG) of WEAVE data. IAC is responsible for the Advanced Data Processing (APS) of WEAVE data. In addition, both IAC and OCA are responsible for several Contributed Softwares/Products to complement APS for the analysis of Galactic Archaeology data. The French involvement in WEAVE (SWG and QAG, pipeline making, management), are duties part of a Service National d'Observation (ANO4-WEAVE), supported by CNRS Earth & Space and CNAP (astronomer duties).

Beyond the Galactic Archaeology surveys, an additional three surveys are led either by French STL (QSO, M. Pieri), or by IAC STL (Galaxy clusters and WEAVE-APERTIF), and similarly, the running of these surveys involve at various levels (SWG, quality assurance, contributed softwares/products), personnels in IAC and/or CNRS/CNRS Earth & Space labs. At IAC, about 15-20 IAC researchers are involved at different levels in the different WEAVE surveys. At CNRS/CNRS Earth & Space, ~ 20 researchers and one engineer are involved in the Service National d'Observation (ANO4-WEAVE). The ASTEROSHOP collaboration (PI. G. Thomas IAC) aims to establish a comprehensive understanding of the inter-survey homogenization process and to develop new

methodologies that ensure the compatibility and accuracy of spectroscopic surveys. This effort will be particularly crucial for the WEAVE data legacy.

3 Galactic Archaeology Science Cases between France and IAC

3.1 Galactic dynamics

3.1.1 The Galactic disc with WEAVE

The goal is to establish a holistic dynamical model of the Milky Way disc. This is a long-term endeavor, which needs the combination of Gaia data with ground-based spectroscopic surveys like WEAVE.

3.1.2 The nature of Galactic spiral arms

As a subtopic of the previous one, understanding the nature and formation of spiral arms pertains to the fundamental identity of the Milky Way. Our joint teams are already working together to pose new constraints on the time evolution of the spiral arms by selecting different tracers of disc morphology (e.g. Gaia Collab., Recio-Blanco et al. 2023), including both young (e.g. Blue Loop stars, Poggio et al. 2022) and old Red giant stars (Palicio et al. 2023; Khalil et al. 2025; Barbillon et al. 2025a) stars.

3.1.3 Streams, dwarf galaxies and dark matter

Stellar streams provide the best means to quantify the profile and flattening of the gravitational potential at large distances (beyond 20 kpc). Among the WEAVE GA surveys, the GA-LRhighlat survey aims, among other things, to measure the radial velocities of stellar stream members across the whole Northern sky. The streams velocity dispersions, which are sensitive not only to the progenitor's mass but also to the stream's dynamical age, the asphericity of the MW gravitational potential, and interactions with dark matter subhaloes. A collaborative effort is ongoing on the interpretation of stream kinematics to constrain dark matter substructures through 'gaps', needing a detailed modelling of the progenitors and how stars leak from them.

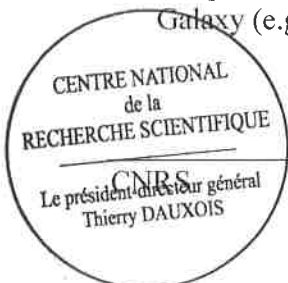
3.2 Star formation history and chemical evolution of the Milky-Way

3.2.1 Chemical probes of Galactic assembly with WEAVE

The WEAVE High-resolution leg of the Galactic Archaeology survey will provide ~ 1 million stars down to $G \sim 16$, with detailed chemical composition of stars in all galactic components (disc, halo, substructures, open clusters). Operationally, this is an important component since it is the prime user of bright time, among all WEAVE surveys. This survey is at the heart of several collaborations between French CNRS/CNRS Earth & Space and IAC researchers on many different topics. Below we highlight a few salient ones (Sec. 3.2.2, 3.2.3, 3.3).

3.2.2 Role of radial migration in the Galactic disc

An important aspect of Galactic assembly involves internal mechanisms such as radial migration (Sellwood & Binney, 2002), related to the nature of spiral arms. WEAVE GA-HR survey will allow us to identify spectroscopically many of these stars, in particular towards the outskirts of the disc, where the velocity dispersions of the migrators, when compared to the underlying population is directly linked with the accretion history of our Galaxy (e.g. Minchev et al. 2012).



3.2.3 Chronogal: timing the mass assembly of the Milky-Way

The study of the Milky Way's stellar populations is inherently complex, as we cannot observe the population in its entirety but only the subset of stars accessible within our instrumental and data processing limitations. A dissection of the populations based on stellar chemistry is crucial, since the chemical composition provides deeper insight into the star-formation history experienced by the Galaxy. WEAVE is expected to significantly increase both the number and spatial coverage of stars with Gaia-quality astrometry compared to currently available spectroscopic databases. The ChronoGal project, led by Dr. Carme Gallart at the IAC aims at disentangling the star formation histories of the different Galactic populations. A collaboration between experts in the WEAVE high-resolution data products and the ChronoGal team at the IAC shall substantially strengthen and optimize this analysis.

3.3 Extremely metal-poor stars with Pristine and WEAVE

The metal-poor Galactic stellar population is expected to contain the old stars formed in the young Universe from the gas enriched by the explosion of few massive stars of the first stellar generation (Population III stars). In recent years French and IAC astronomers have teamed up to produce the Pristine Survey (Starkenburg et al. 2017, Martin et al. 2024), a large photometric survey conducted over more than 170 nights at the Canada-France-Hawaii Telescope with a narrow-band filter centred on the CaII H&K lines. Both French and Spanish have put a substantial effort both in terms of funding and manpower to build the WEAVE facility (Jin et al. 2024). One of the main results expected from the WEAVE Galactic Archeology survey is to increase by an order of magnitude the number of EMP stars for which a detailed chemical abundance can be determined.

4 New collaborations around and beyond WEAVE

4.1 The Galactic Center

Understanding the formation and evolution of galaxies is one of the most intriguing questions in astrophysics. The investigation of the Milky Way Nuclear Star Cluster (MWNSC) is an emerging field in its infancy (Schödel et al., 2014). The early star formation and chemical enrichment history of the Galactic center region is expected to be unique, but typical for nuclear star clusters. The French team has a wide experience in the analysis (chemical and dynamical) of these systems in the Galactic Center while the IAC has unique tools to establish detailed star formation histories together with its chemical evolution models, as explained in the previous subsection. A combined effort of these teams will allow the formation history of the Galactic nucleus.

4.2 Quasars with JPAS and WEAVE

The strong relationship between France and Spain is not limited to WEAVE survey building and analysis. The Spanish-Brazilian narrow-band imaging survey J-PAS plays a key role for the survey WEAVE-QSO. Through a long-standing MoU and joint effort, J-PAS and WEAVE-QSO collaborate on the production of high-fidelity $z > 2$ quasar targets for the WEAVE-QSO survey. Furthermore, a variety of joint analyses are planned, particularly related to large-scale structure analysis and quasar properties. Through the French-Spanish collaboration intends to make further progress on the flow of targets from J-PAS to WEAVE.

5 Collaborations for upcoming Gaia data releases

There are two areas in which WEAVE can contribute to improve the final release of the Gaia data (foreseen around 2030): radial velocities and stellar chemo-physical parameters.

5.1 Gaia radial velocities

One peculiarity of the RVS instrument is that it is self-calibrating: to transform the pixels into wavelengths, it uses its own observations of stars of known radial velocity. The primary radial velocity standards for RVS are a small number, 2800 stars from Crifo et al. (2010) and 6300 from Soubiran et al. (2018). WEAVE holds the promise of providing radial velocities with a precision of better than 1 km s⁻¹ for about 1.5 millions stars, among these it should be possible to select of the order of a few 10⁵ stars to be used as secondary radial velocity standards for the final Gaia data release.

5.2 Gaia stellar chemo-physical parameters

In addition, the RVS spectra are analysed by the DPAC GSPspec module (Recio-Blanco et al. 2023), to estimate the main atmospheric parameters (effective temperature, T_{eff} , stellar surface gravity, $\log(g)$, global metallicity $[M/H]$, and the global abundance of α -elements with respect to iron, $[\alpha/Fe]$), together with the individual abundances of up to 15 different chemical elements. The homogeneous spectroscopic WEAVE observations will be used as crucial calibration references for the Gaia GSPspec chemo-physical parameters enhancing the synergy between Gaia and ground-based facilities.

References

Barbillon et al. A&A 2025 693, A3 – Crifo et al. 2010, A&A, 524, A10 – Gaia Collaboration Prusti et al. A&A 2016, 595, 1 – Jin et al. 2024, MNRAS, 530, 2688 – Khalil et al. 2025, A&A, 699, A263 – Martin et al. 2024, A&A 692, A115 – Minchev et al. 2012, A&A 548, A126 – Palicio et al. 2023 A&A, 670, L7 – Poggio et al. A&A 2022, 666, L4 – Recio Blanco et al. 2023, A&A, 674, A29 – Schödel et al. 2014, Class. Quantum Grav. 31 2 – Sellwood ; Binney MNRAS 2002, 336, 785 – Soubiran et al. 2018, A&A, 616, A7 – Starkenburg et al. 2017, MNRAS, 471, 2587 –4

ANNEX 2: HUMAN AND FINANCIAL RESOURCES

Director of FSLAC:

Dr Ramon García López (IAC, Spain)

Deputy Director

Dr Bernard Gelly (CNRS/FSLAC, France)

1) FSLAC staff:

Laboratory Full Members, as of January 2026

CNRS:

- ✓ CNRS/CNRS Earth & Space: 4 ETP / year
 - Bernard Gelly (DR1, THEMIS)
 - Fabio Acero (CRCN, High Energy)
 - Étienne Pariat (CRCN, THEMIS)
 - Richard Douet (IECN, THEMIS)
 - + pending 1 engineer
 - + pending 1 postdoctoral researcher
 - +A. Briscioli (PhD)
- ✓ CNRS/ CNRS Nuclei & Particles: At this stage, the contribution of CNRS Nuclei & Particles to the Laboratory is not defined as of the start of the Laboratory agreement. Later contributions are anticipated in the framework of the CTAO (Cherenkov Telescope Array Observatory) and CMB (Cosmic Microwave Background) scientific projects.

IAC:

- ✓ IAC: 3 ETP / year
 - Ramón García López
 - José Alberto Rubiño-Martín
 - Marian Martínez González
 - Savita Mathur
 - Elena Khomenko
 - Fernando Moreno Insertis
 - Mónica Vázquez Acosta
 - Artemio Herrero Davo

FLSAC Full Members Affiliated to the «Parties»	Associated researchers* from France (CNRS and Universities) Affiliated to partner organisations	Associated researchers* from Spain Affiliated to partner organisations
Ramon García López (IAC), Director of the Laboratory		
Bernard Gelly (FSLAC), Deputy director of the Laboratory		
Richard Douet (FSLAC)		
Fabio Acero (FSLAC)		
Etienne Pariat (FSLAC)		
Science Axe 1		
	P. Cristofari, A. Zech (LUX)	JP Lenain, D. Kerzberg (LPNHE)
	L. Tibaldo, P. Martin, Q. Remy (IRAP)	A. Fiasson, D. Sanchez, G. Maurin (LAPP)
	G. Henri, B. Cerruti, PO Petrucci, G. Dubus (IPAG)	F. Brun, F. Schuessler, T. Stolarczyk, K. Kosack (CEA)
		R. Terrier, B. Khelifi, A. Djannati-Atai (APC)
		M. Lemoine (LP2IB) J. Biteau (IJCLab)
		H. Costantini, F. Cassol (CPPM) J. Devin, A. Marcowith, Y. Gallant (LUPM)
Science Axe 2		
	A.S. Brun (AIM/CEA)	F. Moreno-Insertis (IAC)
	T. Corbard (LAGRANGE)	M. Martínez González (IAC)
	G. Aulanier (LPP)	M. Collados (IAC)
	S. Masson (LPP)	E. Khomenko (IAC)
	L. Bigot (LAGRANGE)	P. Luis Palte (IAC)
	C. Froment (LPC2E)	
	B. Perri (IAS)	
	F. Leblanc (LATMOS)	
Science Axe 3		
	N. Ponthieu (IPAG)	J.-A. Rubiño-Martín (IAC)
	F.-X. Désert (IPAG)	R.T. Génova-Santos (IAC)
	B. Maffei (IAS)	A. Fasano (IAC)
	N. Aghanim (IAS)	R.J. Hoyland (IAC)
	M. Bouzit (IAS)	
	A. Chappard (IAS)	
	G. Lagache (LAM)	
	A. Beelen (LAM)	

	M. Bethermin (ObAs)	
	A. Monfardini (Institut Néel)	
	A. Benoît (Institut Néel)	
	M. Calvo (Institut Néel)	
	J.-F. Macías-Pérez (LPSC)	
	J. Bounmy (LPSC)	
	O. Bourrion (LPSC)	
	A. Catalano (LPSC)	
Science Axe 4		
	M. Langlois (CRAL)	R. Rebolo (IAC)
	G. Moretto (CRAL)	N. Lodieu (IAC)
	M. Tallon (CRAL)	I. Montilla (IAC)
	O. Flasseur (CRAL)	
	E. Thiébaud (CRAL)	
	X. Delfosse (IPAG)	
	A. Carloti (IPAG)	
	M. Deleuil (LAM)	
Science Axe 5		
	B. Famaey (ObAs)	D. Aguado (IAC)
	R. Ibata (ObAs)	C. Allende Prieto (IAC)
	N. Martin (ObAs)	G. Battaglia (IAC)
	A. Siebert (ObAs)	C. del Burgo Diaz (IAC)
	P. Bonifacio (LIRA)	E. Fernandez-Alvar (IAC)
	E. Caffau (LIRA)	C. Gallart (IAC)
	P. Francois (LIRA)	J. Gonzalez Hernandez (IAC)
	F. Royer (LIRA)	C. Hernandez-Monteagudo (IAC)
	M. Spite (LIRA)	A. Lopez Aguerri (IAC)
	P. de Laverny (OCA)	G. Thomas (IAC)
	V. Hill (OCA)	
	G. Kordopatis (OCA)	
	A. Recio-Blanco (OCA)	
	M. Schultheis (OCA)	
	C. Soubiran (LAB)	
	C. Babusiaux (IPAG)	
	M. Pieri (LAM)	

Associated researchers*: refers to individuals who may develop strong collaborations with the personnel of FLSAC and whose employers shall, for this purpose, enter into specific agreements with the Parties to allow the presence of the associated researchers in the Laboratory. Such specific agreements shall preview notably as follows:

- Requirements of safety, liability and discipline;
- Requirements of mentions in publications, confidentiality and intellectual property in compliance with this Agreement.

2) Laboratory financial resources for 2026:



CNRS: 10 000 € (CNRS Earth & Space). At this stage, the contribution of CNRS Nuclei & Particles to the Laboratory is not defined as of the start of the Laboratory agreement. Later contributions are anticipated in the framework of the CTA and CMB scientific projects.

IAC: 3 000 € to cover expenses directly related to the participation of IAC staff in the laboratory's activities.



ANNEX 3: PREMISES

The premises allocated to FSLAC will consist in the following:

According to where the seconded staff are based (Tenerife or La Palma), approximately 10m² of standard equipped office space will be allocated at the IAC's premises.

Infrastructures made available to the staff seconded to the Laboratory by each Party:

CNRS:

- LOFAR : International Low Frequency Radio Array Telescope Oude Hoogeveensedijk 4, 7991 PD Dwingeloo, The Netherlands, <http://www.lofar.org/>
- CTA : Cherenkov Telescope Array in Chili
- CFHT : Canada-France-Hawaï Telescope - CFHT, 65-1238 Mamalahoa Hwy, Kamuela, Hawaii 96743, USA , <http://www.cfht.hawaii.edu/>
- IRAM (*Institut de radioastronomie millimétrique*) : Institute of Millimetric Radio Astronomy - 300 rue de la Piscine, Domaine Universitaire 38406 Saint Martin d'Hères, France?, <http://www.iram-institute.org/>
- ESO : European Southern Observatory as well as The French Solar telescope
- THEMIS – Laboratory SFLAC, c/o IAC, Via Lactea s/n, ES-38205 La Laguna, SPAIN, www.themis.iac.es
- The Observatory of Haute Provence – Observatoire de Haute-Provence, *UMS Pythéas* - CNRS - AMU, 04870 St.Michel l'Observatoire , France, <http://www.obs-hp.fr/>
- The Bernard Lyot Telescope – Télescope Bernard Lyot, Observatoire Midi - Pyrénées 57 Avenue d'Azereix , 65000 Tarbes, <http://www.tbl.omp.eu/>
- Nancay radio telescope – Station de Radioastronomie de Nançay, route de Souesmes, 18330 Nançay, France, <https://www.obs-nancay.fr/>

IAC: in general all the astronomical facilities of the Canary Islands Observatories, as well as the technological capabilities of the IAC premises in Tenerife and La Palma, and in particular:

- **QUIJOTE I + II** Microwave telescope for the study of cosmic background radiation, OT.
- **CARLOS SÁNCHEZ TELESCOPE** 1.5 m infrared telescope, OT.
- **MAGIC I + II** Cherenkov 17 m telescopes for the study of high energies, ORM.
- **LST1** 23 m Cherenkov Telescope for the study of high energies, ORM.
- **CTA-NORTH** Cherenkov telescope network for the study of high energies, ORM.
- **GTC** 10 m optical telescope, ORM.



ANNEX 4: MODEL OF DEED OF ACCESSION

To be sent to the Parties

... [specify name of establishment, address and representative]

By signing this document, ... [specify name of establishment] becomes a new Laboratory Party and accepts the following provisions:

In general:

... [specify name of establishment] undertakes to comply with all the provisions of the Agreement.

More specifically:

- ... [specify name of establishment] undertakes to provide resources to contribute to the Laboratory's Programme:

- ... euros per year
- ... researchers
- (other resources)

- ... [specify the name of the establishment] becomes Party to the Laboratory for a period of ... year(s) [to be completed] or until ... [date].

- ... [specify name of establishment] takes part in the Steering Committee with entitlement to vote.

- ... [specify name of establishment] is co-owner of a Result under the conditions set out in Article 12 of the Agreement. If the new Laboratory Party is French, [specify the name of the French institution] is designated as the "Institution Mandatory" according to French law and is the sole contact for the Administrator Institution on behalf of the French co-owners.

- Article 8.1 applies to publications. The name of ... [specify name of establishment] is added after those of the other Parties.

- In article 11, the ... [specify name of establishment] contact for the Agreement is added as follows: For ... [specify name of establishment] ...

Signature (place and date)

