Research evaluation

EVALUATION REPORT OF THE UNIT

CPPM – Centre de physique des particules de Marseille

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Aix-Marseille université — Amu,
Centre national de la recherche scientifique — CNRS

EVALUATION CAMPAIGN 2022–2023
GROUP C

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In the name of the expert committee[1]:

Mr Fernando Ferroni, Chairman of the committee

For the Hcéres [2]:

Thierry Coulhon, President

Under the decree n° 2021-1536 of 29th November 2021:
[1] The evaluation reports 'are signed by the chairperson of the expert committee'. (Article 11, paragraph 2);
[2] The president of the Hcéres 'countersigns the evaluation reports established by the expert committee and signed by their chairperson.' (Article 8, paragraph 5).

This report is the result of the unit's evaluation by the expert committee, the composition of which is specified below. The appreciations it contains are the expression of the independent and collegial deliberation of this committee. The numbers in this report are the certified exact data extracted from the deposited files by the supervising body on behalf of the unit.

MEMBERS OF THE EXPERT COMMITTEE

Chairperson:	Mr Fernando FERRONI, Gran Sasso Science Institute, L'Aquila, Italia
Experts :	Mr Nicolas ALAMANOS, Commissariat à l'énergie atomique (CEA), Saclay Mr Tiziano CAMPORESI, European Organization for Nuclear Research (Cern), Geneva, Switzerland Ms Sara DIGLIO, CNRS Nantes (représentante CoNRS) Mr Benoit CLÉMENT, Université Grenoble Alpes — UGA (représentant du CNU) Ms Valérie CHAMBERT, CNRS Orsay (représentante du personnel d'appui à la recherche) Ms Sophie HENROT-VERSILLÉ, CNRS Orsay Ms Andreas HAUNGS, Karlsruhe Institute of Technology, Germany

HCÉRES REPRESENTATIVE

Mr Guy CHANFRAY

CHARACTERISATION OF THE UNIT

- Name: Centre de Physique des Particules de Marseille
- Acronym: CPPM
- Label and number: UMR 7346
- Number of teams: 8
- Composition of the executive team: Mr Cristinel DIACONU

SCIENTIFIC PANELS OF THE UNIT

ST Sciences et technologies

ST2 Physique

THEMES OF THE UNIT

The laboratory is part of the *Institut national de physique nucléaire et de physique des particules* (IN2P3), under the joint supervision of the French National Centre for Scientific Research (CNRS) and Aix-Marseille University. The research conducted at CPPM is at the crossroads of two infinites; ranging from the study of the elementary components of matter – the infinitely small – to the exploration of the cosmos – the infinitely large. An important asset is the ability to build state-of-the-art detector systems, often required to operate under extreme conditions: deep under the sea, in space or underground. Most of the research is carried out within leading international scientific collaborations with a worldwide recognition. The training of young people for research careers is an integral part of the mission as well as the promotion of technological developments resulting from research. The research is aligned along three main axes:

- *Particle physics:* of the infinitely small, to identify the most basic constituents of matter, measure their properties and understand their interactions
- *Astroparticle physics*: the infinitely large seen through the infinitely small: studying the most violent phenomena in the Universe to look for the origins of very high energy cosmic rays and radiation
- *Observational cosmology*: direct studies of the infinitely large to determine and understand the history of the Universe, its origins, evolution and the nature of its constituents.

In addition to these three main axes of fundamental research leading to frontiers of scientific and associated technology, there is a commitment to interdisciplinary themes and their societal applications, such as biomedical imaging, modern intensive computing and studies of the deep-sea environment.
In particle physics the main experiments are Atlas and LHCb at Cern and Belle 2 at KEK as well as the effort for searching the Dark Matter in MadMax and Dark Side.
The main efforts in astroparticle physics are in the neutrino sector (ANTARES/KM3Net-Orca) and with Cherenkov telescope (HESS/CTA).
Cosmology is performed through Renoir that groups a set of participation in different instruments amongst which Euclid, Vera Rubin/LSST, BOSS/eBOSS and DESI.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

CPPM, the Marseille Particle Physics Centre is a Joint Research Unit (UMR 7346) created in 1983. Its main building (5800 m2) is situated on the Luminy Campus where the personnel and most of the experimental facilities are situated. The CPPM operates a Control Room at the *Michel Pacha* Institute (La Seyne sur Mer) and benefits since 2021 from additional technical and meeting space (350m2) in TPR2 building on the Luminy Campus.

RESEARCH ENVIRONMENT OF THE UNIT

CPPM was the host Laboratory for the Excellence Initiative (Labex) OCEVU 2012–2020. The OCEVU Laboratory of Excellence (Origins, Constituents and EVolution of the Universe) is a federative project aimed to explore the big questions of contemporary physics on the history of the Universe, its origins and what constitutes it. The OCEVU Labex gathers the whole academic community working on these research fields located in the Southern belt of France (Marseille – Montpellier – Toulouse), and catalyses collaborations on interdisciplinary projects. Built on the strengths and complementarity of teams of six labs: CPPM, CPT, LAM – Marseille; L2C, LUPM – Montpellier; IRAP – Toulouse, it involves 140 scientists, 100 postdocs and PhD students, and 160 high-level engineers and technicians. It is managed by Aix-Marseille University (Amu with A*MIDEX Foundation) with CNRS, Montpellier and Toulouse Universities as partners. Started in 2012, the OCEVU Labex was an eight-year project which was funded at the level of a total of 10 M€ by the '*Programmes d'Investissement d'Avenir*'. The operational level comprised a coordinator (from CPPM) and an Administrative Coordinator (from CPPM) together with the two coordinators of the six Working Groups (OWG): Astroparticle Physics, Cosmology, Particle Physics, Education, Technological Transfers, and Communication/Outreach (5 out of the 12 are from CPPM).

As a follow-up of the labex OCEVU, the three Marseille Laboratories CPPM, LAM and CPT have succeeded in building a new Amu Institute called 'Institute for Universe Physics' (IPhU). The institute has been approved in 2019 and started functioning in 2021. The institute brings together and synergies theoretical, observational and experimental skills which are internationally recognised. This synergy represents a unique added value that contributes to the sustainability of the intimate connection that IPhU perpetuates between research, its Graduate School's internationalised and innovative education, and the socio-economic world. The IPhU is an ambitious project promoting and supporting sustainable cross-fertilisation between its three pillars: Research, Education and Innovation/Transfer. It is rooted on three research units of excellence: CPPM, CPT and LAM; two components: Faculty of Sciences and OSU Pytheas; one doctoral school: ED352 – Physics and Sciences of Matter; three CNRS Institutes: IN2P3, INP and INSU. Its driving force is fed by: 210 staff (110 HDR): 100 scientists, 110 engineers, technicians and administrative personnel (note that only 50 out of the 110 HDR currently supervise one – or two – PhD student – s – because of lack of PhD grants available); 35 postdocs, 65 PhD and 70 master students on average. CPPM is also a founding member of the Amu institute Imagine. The ambition of Marseille Imaging is to lead, coordinate the imaging forces and strengthen the training-research link on the site as well as the attractiveness and socio-economic development. Resolutely multidisciplinary, the institute aims to promote collaboration between data science, instrumentation and application (co-design) actors in research and training in four priority areas: ultimate imaging, imaging therapy, emerging and disruptive techniques, imaging for all.
CPPM was part of the initiative committee that applied and gained the project IDéal within the PIA4/GUR program IDéeS. The Idéal program (19 M€ over 8 years) includes three main axes, amongst which the *CEntre de formation et de soutien aux Données de la REcherche*, Cedre.
The CPPM also participated at the submission of the CISAM+ project, winner of one of the 'ExcellencEs' projects. Aix-Marseille University won the largest envelope in this first wave with a grant of 40 M€. It will finance the CISAM+ project, which plans to open new Cities of Innovation and Knowledge on its campuses in Aix and Marseille.

UNIT WORKFORCE: in physical persons at 31/12/2021

Permanent personnel in active employment	
Professors and associate professors	5
Lecturer and associate lecturer	4
Senior scientist (Directeur de recherche, DR) and associate	11
Scientist (Chargé de recherche, CR) and associate	20
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	75
Subtotal permanent personnel in active employment	**115**
Non-permanent teacher-researchers, researchers and associates	3
Non-permanent research supporting personnel (PAR)	13
Post-docs	13
PhD Students	26
Subtotal non-permanent personnel	***55***
Total	**170**

DISTRIBUTION OF THE UNIT'S PERMANENTS BY EMPLOYER: NON-TUTORSHIP EMPLOYERS ARE GROUPED UNDER THE HEADING 'OTHERS'.

Employer	EC	C	PAR
CNRS	0	33	85
Aix-Marseille Université	9	0	4
Total	**9**	**33**	**89**

UNIT BUDGET

Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)	16,058
Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP idex, I-site, CPER, territorial authorities, etc.)	3,358
Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)	9,769
Own resources obtained from international calls for projects (total over 6 years of sums obtained)	3,962
Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.).	3,214
Total in euros (k €)	**36,361**

GLOBAL ASSESSMENT

This review committee is pleased to acknowledge the brilliant activity of CPPM. The three main axes of research are facing the most relevant questions posed by Nature to the researcher in Physics. Atlas, LHCb and Belle 2 work at the energy frontier and at the intensity frontier to check and eventually find the deficiencies of the particle physics Standard Model. KM3NeT and CTA look at events generated by the violent universe to find their sources and understand the mechanism of production. Renoir team through the participation in several different frontier experiments in cosmology seeks the validation of the LambdaCDM standard model. Through the Orca side, KM3NeT will have a chance to define the neutrino mass hierarchy. The pluridisciplinary engagement is well anchored in the global research landscape and the laboratory has a clear visibility both at national and international level.
The technical services are a strong point of the unit and of paramount importance for the success of its endeavours.
There are good and fruitful relations with CPT institute where many of the subjects studied by the experimental teams are also fields of theory studies. The synergy with the experimental work carried in the experiments is very good.
The committee considers that all the reviewed teams are at the best scientific level, with a strong national or international reputation. We note that Belle 2 and Photon teams are small so that they should carefully assess their possibilities in the frame of the large collaborations they belong to.
A short summary of the assessment for each team is now given.
The Atlas team continues to have a very strong and visible role in the experiment at the Cern L H C. The team has successfully achieved the construction of a new, advanced detector and continues to have an excellent contribution to the data analysis and the scientific output of the experiment. There is a crucial and successful involvement of the technical services.
The LHCb team is large, with a strong technical involvement in particular leading the effort for the data acquisition control module being proposed for the future upgrade of LHCb and responsible for the computing framework Dirac used by LHCb and other collaborations to handle the LHC data flow and analysis.
The Belle 2 team is a recent addition to the portfolio of laboratory research division. Born from an opportunity given by an ERC is essentially a split of a little group from LHCb. It is focused on analysis items where manifestly the competence exists. For a long-term sustainability, it should get involved in the developments of the electronics services thought for Atlas but that might very well adapted to the evolution of the Belle 2 vertex detector.
The Neutrino team is performing excellent work and is the central group in the IN2P3 flagship experiment KM3NeT. In terms of astroparticle physics of high-energy neutrinos, the team is one of the world's leading and most visible institutes. A major achievement of the team is the installation and operation of the LSPM platform,
The Photon team has found a visible role in the preparation of CTA. It is, however, a tiny group with limited resources so that it should focus on what is realistically doable.
The Dark Matter team has been only recently constituted. It has found a role in the preparation of the DarkSide experiment and it is going after a very promising line with an R&D activity in the preparation of an experiment for axion searches that would span an interesting region of the phase space.
The Renoir team is one of the pillars of CPPM. It significantly contributed to Euclid and LSST/Vera Rubin while at the same time developing a state-of-the-art scientific strategy to prepare for the analysis of the data of those projects. Among others, its major involvement in the NISP instrument gives them a central role in the fight against instrumental systematics studies for the interpretation of future data. The team is a key player in the field of cosmology, bringing together both photometry and spectroscopy skills.
The imXgam team got impressive results in biomedical imaging new developments. It is a remarkable activity despite the small size of the team. The team contributes to education with a high number of PhD students.
The platform LSPM is of extraordinary relevance for the future of the laboratory and it helps to consolidate CPPM's leading role in the construction of the IN2P3 Flagship Experiment KM3NeT/Orca.
The committee praises the direction for having put in place both the 'Funding Programs' transversal structure and the Open Science and Communication Unit, both essentials for helping attraction of external funding and a proper outreach program and increased visibility of the laboratory.
The technical staff stays constant in time, however, particularly in the ICT sector the committee sees that many people will retire in the next two years and the experts acknowledge the difficulty of replacement given the difficult market conditions.
The future direction, at least in the midterm, is clearly identified. HL-LHC, now foreseen for 2029 will provide a huge wealth of data and both Atlas and LHCb are participating in the upgrade phase of the detectors. Belle 2 is expected to profit from the ramping up of the integrated luminosity of SuperKeKB and will have an opportunity to confront its results with the ones of LHCb. KM3NeT and CTA are in the starting phase and are expected to get at full speed in the course of the next years. Renoir team, mainly profiting from the Vera Rubin observatory and Euclid data, is in great position to contribute to the studies of the cosmos.
Finally, the unit is well organized, with a direction team paying full attention to a careful planning of the human and technical resources, but also to other important aspects such as safety, health, equal opportunity or training.

DETAILED EVALUATION OF THE UNIT

A – CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The committee congratulates the direction of the laboratory for having taken properly into account the recommendations of the previous evaluation of the unit.
The laboratory is handling in a very effective way the transition from Labex-OCEVU to a new set of structure like IPhU, Imagine, Cedre and CISAM+.

The international visibility has increased thanks to the relevant international responsibilities taken in the experiments and two ERC have been gained.
The outreach activity is conducted at high quantitative and qualitative level.
The level of technological skills is preserved through a wise policy of promotion and recruitment.

B – EVALUATION AREAS

EVALUATION AREA 1: PROFILE, RESOURCES AND ORGANISATION OF THE UNIT

Assessment on the unit's resources

CPPM personnel amount to 170 in December 2021. At the end of last year, they were distributed as 75 technical and administrative staff, 40 researchers and 3 emeritus, 26 PhD students, 13 temporary researchers (post-docs) and 13 non-permanent technical staff. The total personnel can fluctuate above 200 including internships and short visits (in particular during the first half of the year). This shapes the overall activity of the laboratory: highly qualified and versatile technical personnel enable the researchers and engineers to study, design, build, operate and lead significant projects at the international scale, thereby exploiting with maximal visibility the scientific reach of those projects. The technical personnel is associated to the projects following a review process. The technical workforce is predominantly allocated to the Atlas upgrades and KM3NeT construction, and demonstrates the CPPM strategy to invest massively in flagship projects at this point in time. In terms of evolution one can observe a relative stability and a slight increase in the permanent personnel over the period. The ages pyramid remains a concern. The number of temporary contracts is stable. The recruitment pattern of the technical and administrative personnel follows a multi-annual strategy discussed with CNRS and Amu. This strategy takes into account: the individual retirement previsions, the associated expertise, the projects plans and the scientific strategy. It takes into account as well as the internal grooming of talents and the networking at national and international levels.

Assessment on the scientific objectives of the unit

For the next decade, CPPM will follow its strategic lines of probing the Matter (the infinitely small) and the Universe (the infinitely large) as briefly described below. Atlas and LHCb will have a long life following the evolution of LHC upgrades. Belle 2 at KEK is starting to enjoy this high intensity machine and the local team will have a chance to cross-check results with the LHCb ones. Dark Matter is a relatively new engagement and is expected to produce results sometime in the future. Building and exploiting KM3Net is a long-term engagement and might bring to the determination of neutrino mass hierarchy. CTA, also in construction, will be the most powerful tool to explore the high energy photons falling on Earth from the Universe, surpassing the HESS/MAGIC findings.
Great potentialities will be offered to Renoir team by the future data coming from Euclid, the Vera Rubin Observatory, DESI and ZTF.
ImXgam is an asset in interdisciplinary technology.

Assessment on the functioning of the unit

The unit has an efficient management structure and organisation. The excellence of research performed and the qualities of the researchers together with motivation and commitment of IT staff allow a smooth and successful functioning. The technical skills are high, the unit has the ability to develop cutting-edge technologies and is extremely well placed in the international landscape.
Its geographical position is an asset in hosting the 'low energy' side of the large underwater observatory KM3Net and CPPM is a key partner of the multidisciplinary platform LSPM, arising from this large project.

1/ The unit has resources that are suited to its activity profile and research environment.

Strengths and possibilities linked to the context

Although resources in basic science are never and nowhere enough as seen from the laboratory point of view, the committee would say that the research program of the institute is very well balanced with respect to existing human resources. Funding is adequate for the time being at least for the core program.

Weaknesses and risks linked to the context

General concerns are on the ability of replacing key engineers/technicians with specific skills and leadership ability due to the public/private salary gap. Although the core program looks adequately staffed and financed, there is a lack of extra resources for R&D that should pave the way for future new endeavours and for dedicated staff for tech transfer and innovation goals that are nowadays an integral part of the mission.

2/ The unit has set itself scientific objectives, including the forward-looking aspect of its policy.

Strengths and possibilities linked to the context

The unit teams participate to most of the more challenging projects in the field of particle, astroparticle and cosmology research fields. The unit is properly structured to give the necessary support to the teams, particularly in the dynamic allocation of technical resources. Attention is given to those aspects of technological advances that are susceptible to be transferred to the society.

Weaknesses and risks linked to the context

The objectives of the research carried on by the different teams are clear and in line with the general police set by the laboratory. The scientific council periodically reviews the projects with positive outcomes. No specific serious risk is seen.

3/ The functioning of the unit complies with the regulations on human resources management, safety, the environment and the protection of scientific assets.

Strengths and possibilities linked to the context

The CPPM organisation pays special attention to HR management. The team-service-project organisation is complemented by a special attention given to individuals in the areas of work organisation, well-being and personal development.
In addition to treating regular matters (career confirmations, budget, etc.). The Unit Council (CU) members collect and raise specific problems related to the working conditions and personnel well-being. Those can be brought to the attention of the Direction at any time but also discussed in the CU meetings. Four persons are designed as contact persons for socio-professional risks: the RH admin, the AP, and two persons external to Direction.

The Unit Council has appointed one of its members as referent for gender equality and discrimination. No such case has been signalled over the period.
The CU follows as well the working group on energy economies and environmental protection.
The incoming personnel at all levels is welcomed following streamlined procedures such that the important aspects are taken into account from the very beginning. The newcomers receive a specified documentation package including internal rules and regulations, practical information, practical details on housing and transportation, maps etc. Each visitor or personnel receives a digital and safety training. One administrative personnel deals with the external aspects, in particular for foreign visitors: housing, banks, transportation and helps with more aspects related to the French system (allocations, taxes, etc.). The laboratory has a designed person for IT security, who is in contact with CNRS and Amu.
The computing security rules are regularly reminded (in the monthly General Meetings) and are part of the initial training of the newcomers.
Continuing education for the laboratory's staff is an important aspect to enable them to acquire or consolidate the skills they need, but also to better prepare their career development. The training courses are grouped by category: IN2P3 schools, training in the various departments (electronics, IT, mechanics, administration), and training in communication, health and safety, management and languages. Health and safety training is also important (15%), particularly in order to comply with regulations requiring staff to obtain authorisations before carrying out any risky operations (overhead cranes, forklift trucks, electricity, etc.).
The laboratory takes a particular care to support the personnel career. It should be noted that the CPPM personnel is dominated by the category A ('*Directeurs de recherche/Professeurs*' for the researchers and 'Ingénieurs de Recherche' for IT personnel). The training offer is largely distributed and communicated by a dedicated person, under the supervision of the CPPM Direction. The IT personnel is encouraged and prepared to apply to internal advancement campaigns and CNRS competitions by a careful reading of the personal applications and rehearsals. The internal process of supporting the candidatures is organised in a well-structured and well accepted procedure via an internal 'IT Commission'. This procedure is very well considered and accepted by the personnel. As a result, the rate of promotions is relatively high (in average 7 promotions/year).

Weaknesses and risks linked to the context

For a well-functioning laboratory like CPPM one of the major threats is the nearly impossible mission to compete for attracting high-level researchers and engineers due to the competition of the private sector with respect to the public sector. This is relevant for the electronics and almost dramatic for the computing.
Another possible problem seen on the research organisation is the balance between the length of running projects with the need of carrying on R&D and identifying new future directions. Inertia does not help in this respect.
One aspect to be considered is the administrative help needed by the researchers for efficiently coping with the different funding schemes and associated requirements.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

CPPM teams participate in most of the scientific experiments that have as a mission to answer the most important questions of particle physics and cosmology that are presented to us by nature. Atlas explores energy frontier, LHCb and Belle 2 deal with precision physics, DarkSide aims to unveil the nature of Dark Matter, neutrino mass hierarchy will be addressed by KM3Net/Orca, Renoir addresses the cosmology through participation in the most significative surveys under preparation and ImXgam profits from advanced particle physics technology to transfer it to imaging devices suitable of several utilisation in societal challenges.

1/ The unit has an attractive scientific reputation and contributes to the construction of the European research area.

Strengths and possibilities linked to the context

The CPPM personnel is strongly involved in the management of the various instances of the scientific life (scientific projects, University, science administration, etc.). The CPPM personnel has covered over 2016–2021 about 300 scientific responsibilities, predominantly at the national, and international levels. All the projects contribute in terms of responsibilities both at national and international level. Just as examples the KM3Net spokesperson and the Atlas Lar project leader belong to CPPM. Shortly, the international reputation of the Institute is excellent. Each year, the members of the laboratory take part in 40 to 60 national or international

conferences in order to present the latest scientific results to the scientific community on behalf of the collaborations in which they participate, thus demonstrating the very good visibility of CPPM researchers in major international collaborations. The laboratory organises fifteen to twenty scientific events per year, supported by dedicated personnel specialised in all aspects of organisation
Members of the Institute contribute to the development of National and International research priorities by taking part in a very large number of steering, advisory or scientific committees of different laboratories. Members of CPPM participate in three CNRS GDRs scientific councils. Members of the unit also hold editorial responsibilities in high impact scientific journals and collections
Members of the unit have received various International, European and National scientific prizes and awards. The last few years have been particularly rich in prizes and distinctions (a total of 14). Three CNRS medals and crystals were awarded during the period of the present evaluation. The talent of the Institute's students was also recognised. Six students won scientific prizes for their doctoral work during the reporting period, including a L'Oréal-UNESCO Jeunes Talents France prize for women in science.

Weaknesses and risks linked to the context

The core business of the scientific program does not present any substantial risk. Where one can find space for improvement is in the R&D for future enterprises both scientific and technological. So as for industrial relations and outreach activities. It looks like that mainstream activities absorb almost all of the energies of the laboratory, inducing a degree of rigidity in the allocation of resources.

2/ The unit is attractive for the quality of its staff hosting policy.

Strengths and possibilities linked to the context

The laboratory is well known worldwide and has a high scientific reputation. Strong networks enhance its visibility. Technology expertise is a strong asset.

Weaknesses and risks linked to the context

Although the lab is able to attract talents from the global market, 27/60 postdoc comes from abroad as well as one ERC, it is not clear whether there is a follow-up program to offer permanent positions with an adequate welcome package.

3/ The unit is attractive because of the recognition gained through its success in competitive calls for projects.

Strengths and possibilities linked to the context

The laboratory is commended for its proactive policy and dedicated structures to survey, prepare and candidate to calls for projects, in particular ANR, European and international.
Two ERC's have been obtained, and ten EU projects have been financed. Furthermore nine ANR, six A*MIDEX and nine CNES projects have been gained. Also several projects have been funded by local authorities and industries.
Compared with the programs average success rate CPPM ranks in general bit higher.

Weaknesses and risks linked to the context

The funds acquired through competitive calls when not directly linked to mainstream project are a double-edge sword. They enhance the attractiveness of the laboratory and give recognition to its researchers, however, they are not part of a coherent policy, the funds do not necessarily go into directions that might be mostly suitable like R&D for future enterprises or valorisation of the research products, particularly in obtaining dedicated personnel.

4/ The unit is attractive for the quality of its major equipment and technological skills.

Strengths and possibilities linked to the context

The laboratory has been a leader in some extremely challenging technological projects directly linked to its scientific program. One example for all is the development of the KM3NeT underwater telescope. The unit took

charge of the design and installation of the underwater network to connect detectors (lines over 200 m high). The challenges were enormous because designing a structure that could connect more than 160 lines, reliable over more than fifteen years, scalable and maintainable with subsea robots is uncommon even in deep offshore environments.
The skills of the laboratory's technical services are often highlighted when responding to calls for tenders from A*MIDEX, the ANR or the South Region. Specific strengths are in microelectronics, fast acquisition and Noble gas detection. Collaboration in fusion plasma DEMON project, in the development of a Compton camera for nuclear dismantling operations, recovery of Xe in medical applications are clear examples of such an activity.

Weaknesses and risks linked to the context

The laboratory develops innovative and state-of-the art technology. It is not shown how this translates in a successful collaboration and tech transfer with industry. As a matter of fact, only one start-up created by CPPM has been successful (imXPAD).

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The teams belonging to the Unit are all part of large international collaborations. The production in terms of papers is abundant and of high quality and in any case follows the rules given by each collaboration.

1/ The scientific production of the team meets quality criteria.

Strengths and possibilities linked to the context

The eight teams of CPPM are at the best scientific level and publish in very high-quality journals such as: Journal of High Energy Physics, Physical Review Letters, Physical Review D, European Physical Journal C, Journal of Instrumentation, Astronomy & Astrophysics, Monthly Notices of the Royal Astronomical Society, Journal of Cosmology and astrophysics… The resulting scientific production is abundant relatively stable in time and amount to an average publication rate of 200/year and about 33 conference proceedings/year. CPPM researchers and engineers give around 60 talks per year. Any fluctuation in the yearly rate shall be attributed to the collaborations publication policies (shutdowns, etc.). It has to be noticed that the LHC experiments account for more than 80% of the total number of published papers.

Weaknesses and risks linked to the context

The low number of publications by the Dark Matter team is not worrisome since the team was created recently. One remark is that looking at the global list of papers it is really not frequent to find papers signed by a single or a very limited number of authors. We recognise that the policy of the large collaborations tends to make this extremely difficult, nonetheless especially for young researches an attempt should be made. It can be an element of great importance for the assessment of the quality of the candidate in the progression of the career.

2/ Scientific production is proportionate to the research potential of the unit and shared out between its personnel.

Strengths and possibilities linked to the context

The scientific production is globally very large. It is dominated by the two LHC experiments that account for roughly 80% of the total number of the papers published in internationally reputed journals with peer revision. However it has to be noted that both in conference presentations and posters and in the conference proceedings the balance is much more in favour of the smaller projects. Neutrino teams perform very well in these categories. As well as Renoir in proceedings and ImXgam in presentations.
There are no anomalies in the time series. The volume of the LHC experiment production has slowed down due to the long shutdown. The Dark Matter teams started only recently they activity so an increase of production is expected to happen.

Weaknesses and risks linked to the context

The production is manifestly inhomogeneous. Large collaborations have almost no margin to negotiate alternative policies with respect to the one imposed by the collaboration. There are obvious advantages but also fragilities, as demonstrated by the difficulty of finding a solution to the problem of signatures of Russian colleagues. The number of talks to conferences is also algorithmically determined and this disadvantage PhD students and postdoctorates when compared to smaller projects, able to have a much larger flexibility.
In all the collaborations an effort should be made to promote individual contributions of the PhD students.

3/ The scientific production of the unit complies with the principles of research integrity, ethics and open science.

Strengths and possibilities linked to the context

The laboratory follows scrupulously the best international practices in research integrity, ethics and open science.
Open science is a strong point where a lot of attention is placed. The 'bonus score' attributed by Amu for the open science publication rate (100% in 2021) has acknowledged this attention.

Weaknesses and risks linked to the context

No risk is seen on this subject.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

Assessment on the inclusion of the unit's research in society

There are a lot of efforts put by CPPM with respect to outreach and divulgation. Most of the initiatives attracted interest in the years before pandemics. Particularly relevant as its frame goes beyond CPPM itself is the 'Fête de la Science'. A lot of scientists are involved in events addressed to the general public. Few groups do not participate, hopefully yet, to these activities, Belle 2, Dark Matter and Photons.

1/ The unit stands out by the quality of its non-academic interactions.

Strengths and possibilities linked to the context

CPPM has a successful policy to inform the general public about scientific and technical advances in research. Communication has become a major strategic issue for the laboratory, and is addressed by a dedicated unit attached to the direction. Scientific communication plays a crucial role and the promotion of the laboratory's image. The actions now take various forms: physical interventions with the general public and young people at the CPPM or outside, but also more innovative means such as mini-MOOCs or multimedia interviews. The program is based on several actions like scientific culture events, both regular and specific, public conferences, lecture series, media presence and innovative actions.
CPPM is recognised as a laboratory with excellent technological expertise and premises. The international level technological contributions lead to the development of a strong technical arsenal.
CPPM has adopted in 2019 a clear policy to structure and value the technical platforms. These are visible at local, national and international levels. They are exploited to increase the laboratory visibility and to attract more funding. The technological excellence of the CPPM technical teams has been recognised by two CNRS Collective Cristal Prizes.
The tech transfer sector/valorisation is pursued at CPPM by a dedicated coordinator. Two visible technology transfer examples have been the creation of start-ups exploiting patents filed by the laboratory: imXPAD and Power Sea.

Weaknesses and risks linked to the context

Although the laboratory has a wide technical expertise and a history of technological state-of-the art developments, the link between the in-house activity and the external world could be improved. The committee acknowledges that the efforts made in the experiments upgrades and platforms creation have been the focus of laboratory technological activities.

2/ The unit develops products for the socio-economic world.

Strengths and possibilities linked to the context

The valorisation is pursued at CPPM by a dedicated coordinator. The unit carries out cutting-edge technological developments in electronics, computing and mechanics for particle physics, astroparticles and medical imaging. These developments have direct or indirect repercussions in the industrial world or for laboratories working in other scientific fields. They are the subject of industrial and academic technological development. Two start-ups were created and there is an activity carried on together with the '*Service Partenariat Valorisation*' of the *'Délégation régionale'* (DR12) and the SATT *('Société d'Accélération de Transfert Technologique'*).

Weaknesses and risks linked to the context

The technological developments for the upgrades of LHC experiments, the deployment of Km3Net and the creation of LSPM platforms are great successes that have absorbed most of the laboratory technical energies. This is a particle physics laboratory and the key to its success and its international visibility is in delivering. On this aspect no compromise should be done. However a lot of attention shall be put, once the pressure decreases, on the items subject to constitute laboratory assets in terms of technological transfer, industrial relations with the goal of producing valorisation.

3/ The unit shares its knowledge with the general public and takes part in debates in society.

Strengths and possibilities linked to the context

Two installations have been built and allocated to several sites. COSMOPHONE and COSMIC WHEEL. The first in display in France and The Netherlands, the second, directed to schools, has been replicated in several dozen. There is an effort in communicating scientific achievements and methodology through public lectures, master classes, science festivals and presence in the media, mostly newspapers and magazines.

Weaknesses and risks linked to the context

Dark Matter and Photon teams are not actively participating in this mission. It is not clear whether the connection between basic research and societal application is sufficiently explained to the general public.

C – RECOMMENDATIONS TO THE UNIT

Recommendations regarding the Evaluation Area 1: Profile, Resources and Organisation of the Unit

The committee suggests making an effort for a better communication of the direction to the administrative and technical staff in order to bridge a gap between the effective policy of people assignment and the feeling of missing resources in specific areas.
In particular the transition from OCEVU to the new initiatives has put a stress to the administrative staff that should be resolved.
The technology transfer structure shall be reinforced for a better scouting ability of the products that might be the object of a transfer to society.
The committee notices a difficulty in finding young people for stages due to the low salary offer. The unit could identify some benefit to alleviate this problem.
The laboratory has made great progress in the transition from ANTARES to the IN2P3 flagship experiment KM3NeT. Here CPPM is now unquestionably the host and central institute for Orca. All efforts must be made by the direction of the laboratory to ensure that funding for the full Orca detector (in the order of an additional €20 million) is secured. Both scientifically and technologically, it is necessary to achieve this assurance in the near future.

Recommendations regarding the Evaluation Area 2: Attractiveness

CPPM has an extraordinary asset to become extremely visible in front of society, scientists and persons like technicians and engineers that would embark on a career in a research institute. The platform LSPM with its infrastructure on the sea shore could be exploited at its best to make CPPM visible and attractive, showing the connection between different disciplines.

Recommendations regarding Evaluation Area 3: Scientific Production

The scientific production is in line with international standards. Some effort could be made in helping young researchers to publish original and individual ideas to enhance their visibility and chances for future positions.

Recommendations regarding Evaluation Area 4: Contribution of Research Activities to Society

Outreach activity can be even more extended. Themes like the existence of Dark Matter are fascinating and should be used to attract general public interest in science and its methods. Connections between different messenger could also be a good communication subject. So as the innovative contribution of basic research to society.
Third-party funded projects (e.g. Horizon Europe programmes) are a good way to generate additional manpower for outreach activities and research of societal interest. With the expertise available in the teams, some possibilities are open here, but the extent to which the sustainability of such time-limited projects can be guaranteed should be considered very carefully and in the view of the unit's strategy.

TEAM-BY-TEAM ASSESSMENT

Team 1: Atlas

Name of the supervisor: Mr Marlon Barbero

THEMES OF THE TEAM

The team which collects 25% of the people of the unit is one of the backbone institutes of the Atlas collaboration. Its key contributions are for the Liquid Argon calorimeter, the pixel tracker and the trigger system.
The members of the team are key players for the operation aspects of these detectors and major contributors to the Phase I and Phase II upgrade for both the Liquid argon calorimeter electronics and Pixel detector. In data analysis they have major responsibilities for all aspects of the identification of b-quarks physics objects. On the research side, they play a significant role in the Higgs Boson characterisation and studies of Beyond the Standard Model scenarios. The group is actively involved in dedicated R&D of Pixel detectors.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has met most of the recommendations made in the previous Hcéres assessment. Two points are not met:

1) It did not manage to organise a major international conference (even if one should consider that over the period of reference the COVID epidemics has prevented this kind of endeavour).
2) The team does not seem to have strengthened the connection with the Centre de Physique Théorique (CPT) of Marseille as it was recommended.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	4
Scientist (Chargé de recherche, CR) and associate	5
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	18
Subtotal permanent personnel in active employment	**28**
Non-permanent teacher-researchers, researchers and associates	2
Non-permanent research supporting personnel (PAR)	4
Post-docs	2
PhD Students	6
Subtotal non-permanent personnel	**14**
Total	**42**

EVALUATION

The overall assessment of the team

The technical skills and responsibilities the team plays in the operation and upgrades of the Atlas detector ensure a high level of visibility within the HEP community at the national and international level. They are crucial for the software aspects of the IBL tracking detector and are leading the software effort for the identification of b-quark signal in the final state and lead the analysis for the relevant final state where the Higgs boson is accompanied by two top quarks (Htt). The reduction of the effective number of people stretches the resources engaged in the present responsibilities and the R&D effort in the domain of future Pixel detectors and associated electronics.

Strengths and possibilities linked to the context

The team is a major French actor in the Cern LHC experimental program. Their key contributions are for the Liquid Argon calorimeter, the pixel tracker and the trigger system.

The members of the team have been key players for the operation aspects of these detectors and major contributors to the Phase I upgrade for both the Liquid argon calorimeter electronics and the innermost layer of the Pixel detector, IBL. They continue to play a key role in the definition of the Phase II upgrades for both the improvements of the Liquid Argon readout and trigger and the pixel detector electronics. Their detector competences and responsibilities are mirrored in their data analysis activities where they have major responsibilities for all aspects of the identification of b-quarks physics objects. The physics production is linked to the exploitation of these competences and focus on a study related to the Higgs Boson characterisation (the group was actively involved in the discovery) and studies of Beyond the Standard Model scenarios. The team is actively involved in dedicated R&D for the Phase II of the experiment and pure R&D related to future evolution of MAPS pixel detectors. The range of activities is attractive for students and offers opportunities to contribute to the progress of High energy Physics. The skills in advanced microelectronics allow connections to the industrial world. The engagement in developing expertise in microstructure like FPGA and the field usage of artificial intelligence approaches in Software allow easy insertion and exchanges with the industrial/commercial world.

Weaknesses and risks linked to the context

The team has been reduced in size with respect to the previous Hcéres evaluation (and some of the members have taken major local or national responsibilities), while, if anything, it has increased in terms of activities. This enhances the visibility of the team but clearly stresses its resources. The main area of concern is the pixel detector development, where on one side the focus is on the delivery of Phase II upgrade commitments while continuing the key role linked to the operation of the IBL and on the other side of the 'pure' R&D on integrated CMOS pixel detector (with a mention of a possible interest with the Belle 2 upgrade).

RECOMMENDATIONS TO THE TEAM

The priority of the team should be the delivery of the Phase II upgrade commitments for both the Calorimeter, Pixel and trigger. Care should be exercised in the resources dedicated to additional R&D. Resource planning should take into account the needs to maintain and operate the Atlas detectors for Run4 of the LHC.

Team 2: LHCb

Name of the supervisor: Mr Olivier Leroy

THEMES OF THE TEAM

The LHCb team is involved in an experiment at LHC. It is a large team with a strong technical involvement in particular leading the effort for the data acquisition control module being proposed for the future upgrade of LHCb. It has the responsibility for the hardware behind the triggerless data taking scheme of LHCb. It is also the main responsible of the computing framework Dirac used by LHCb and other collaborations to handle the LHC data flow and analysis.
The team members are also key contributors to the physics program of LHCb with participation in some of the highest impact analysis linked to the measurements of Standard Model final states where deviations from expectations could lead to understanding of Beyond the Standard Model physics.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The main recommendation of the previous report was to try and increase the participation of team members into teachings at Amu.
This recommendation does not seem to have been followed but it did not prevent the team from finding doctoral students.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	2
Scientist (Chargé de recherche, CR) and associate	4
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	2
Subtotal permanent personnel in active employment	**8**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	1
Post-docs	1
PhD Students	2
Subtotal non-permanent personnel	**4**
Total	**12**

EVALUATION

Overall assessment of the team

The team has an important role within the LHCb collaboration and is recognised for its contributions. It is among the key institutes who are behind the success of LHCb.
Beyond the participation to analysis teams, CPPM LHCb team plays a key role in several technical domains on the instrument (electronics and software) and on the computer framework (Dirac) which are of vital importance to the collaboration.

Strengths and possibilities linked to the context

The role the team has played in the development and construction of the Triggerless acquisition module makes them a central team of LHCb. The role they are now playing in the designing modules of the Real Time Analysis system is a natural continuation of their Hardware development. The recent success in securing an ERC starting grant will allow furthering the team involvement into GPU-based real-time trigger. The team reputation is further strengthened on the hardware side by the role they play in initiating the project for the future acquisition modules PICie40, PCie400. The development work on the micro-cooling approach in view of the future upgrade of LHCB is a new engagement of major importance. The coordination role played until now for the Dirac framework which is now adopted beyond LHCb to control the data and analysis flow of the experiment is another area of the key contribution.

On the research side, the group has been extremely prolific and members of the team contributed directly to some of the most visible results of the LHCb collaboration (e.g. Bs−>μμ, CP violation final states and more recently the analysis related to very rare final states containing tau leptons).

Weaknesses and risks linked to the context

Due to the many areas crucial for LHCb that the members of the team are involved with the major risk is related to possible loss of competences in the event of personnel departures. In particular the main risks are linked to the engagements on the future upgrades where the team had taken responsibilities in crucial electronics developments and developments of micro-cooling. The team being composed purely of CNRS researchers which at the moment didn't prevent them from attracting students despite limited links with the university.

RECOMMENDATIONS TO THE TEAM

The team has engaged in major projects for the Upgrade of LHCb namely the extension of the PCIe40 electronic board – for which resources have already been granted by IN2P3- and the R&D on the micro-cooling for the future vertex detector; consequently the laboratory and team management have to allocate adequate resources to ensure success. The synergies with the Belle 2 hardware (which shares some of the electronics developed for LHCb) should be managed to avoid weakening the overall impact of CPPM: the longer term engagement in the B-physics will require additional manpower.

Team 3: Belle 2

Name of the supervisor: Ms Justine Serrano

THEMES OF THE TEAM

The team stemmed out of the LHCb team in 2019, following Justine Serrano's ERC consolidator grant. The team focus is the study of new physics with tau lepton final states in the Belle 2 experiment at JPARC (Japan). The team members are also involved in the operation, calibration and technical upgrade of the silicon vertex detector which is of paramount importance in tau reconstruction.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

None, the team didn't exist at the time of the previous evaluation

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	0
Subtotal permanent personnel in active employment	**1**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	1
Post-docs	3
PhD Students	3
Subtotal non-permanent personnel	7
Total	**8**

EVALUATION

Overall assessment of the team

The Belle 2 is a young and dynamic team that as quickly gained its place within the collaboration. It relies heavily on an ERC consolidator grant which is both its main strength at present and its main weakness in the future when this grant and the doctoral and postdoctoral contracts it brings comes to an end.

Strengths and possibilities linked to the context

Despite its recent creation, the team has managed to gain a good visibility within the Belle 2 experiment and members are often solicited to present results at international conferences in the name of the collaboration. This has been possible by focusing its effort on a single object, the tau lepton, investing its effort in reconstruction software and analysis of interesting new physics channels involving tau pair final state. The team members can also rely on the important R&D effort at CPPM around silicon sensors to participle actively in upgrades of the silicon detectors of Belle 2.

Weaknesses and risks linked to the context

The team was built around an ERC consolidator grant, which was allowed to rapidly build an active workforce of PhD students and postdoctoral fellows. Unfortunately, only one permanent scientist (apart from the grant holder) did join the team in 2022. There can be serious concern to the future sustainability of the team.

RECOMMENDATIONS TO THE TEAM

The team should start to prepare to the post-ERC future by trying to increase the number of staff scientist. The topics of the studies are of great interest and it is crucial that this activity should go on in the future.
Given the size of the team, the proposal for a contribution on the vertex detector should also be well synchronised with the other IN2P3 teams.

Team 4: Dark Matter

Name of the supervisor: Mr Fabrice Hubaut

THEMES OF THE TEAM

The team is involved in the direct search for dark matter candidates either in the form of weakly interactive massive particles (WIMPs) with the DarkSide-20k experiment or of axions with the MadMax detector. The activities span from R&D, hardware and software developments to simulations, up to data analyses.

DarkSide-20k, the structuring physics project of the team, is the second generation of LAr TPC to be run at Gran Sasso National Laboratory (LNGS) from 2025. It offers a high discovery potential both at low (<10 GeV) and high (> 100 GeV) WIMPs masses. The team is responsible for the conception, construction, installation and commissioning of the in-situ calibration system with radioactive sources.

MadMax is a first-generation haloscope detector based on a novel concept of dielectric booster. It is designed to be sensitive to the axions mass range favoured by the theory from 40 to 400 µeV. The R&D phase (consisting of 4 prototypes) will culminate with the final detector start taking data in 2028 in DESY-Hamburg. The team is involved in the mechanical activities around the prototype booster.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Not applicable: the team has been created in 2020.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	0
Scientist (Chargé de recherche, CR) and associate	3
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	2
Subtotal permanent personnel in active employment	**5**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	1
Subtotal non-permanent personnel	**1**
Total	**6**

EVALUATION

Overall assessment of the team

The team created quite recently in 2020 has already significant contributions and visibility within the DarkSide and MadMax collaborations. The committee appreciates the team's involvement in the different phases of the two experiments and particularly the R&D effort for the haloscope detection technique, a first experimental activities at IN2P3 on the well-motivated and promising field of direct axion search.

Strengths and possibilities linked to the context

Despite only having been created in 2020, the team made already important contributions within the DarkSide and MadMax collaborations in hardware, software and data analysis.
Within the former collaboration, the team is involved in calibration data analysis and hardware developments. In particular, the team participated in an improved analysis of the DarkSide-50 calibration data that allowed for a better calibration of low energy recoil processes and it is responsible for the conception, construction, installation and commissioning of the calibration system of DarkSide-20k, a key piece of hardware of the experiment.
As for MadMax, the committee sees the group's involvement as a very positive opportunity to step into the very promising field of direct searches for axions, a field not yet covered by IN2P3. The experiment is already benefiting from the expertise of the former members of the Atlas team specifically in three-dimensional measurements with micrometre precision (largely developed for the Atlas pixel detectors). The accomplishment of the MadMax disc mechanical supports flatness specifications, with a planarity lower than 10 microns, largely relies on such expertise. This precision is needed for scanning the axion mass and to achieve the physical objectives of the experiment.

In a very short time, the team members have been capable of covering responsible roles such as members of the institutional and physics boards of the DarkSide collaboration and executive board in MadMax, technical coordinators of DarkSide and MadMax. The team contributions are not only very visible within the two collaborations but also well integrated in the national context. One of the team members is the national responsible for DarkSide at IN2P3 and another one is the PI of MadMax within the CNRS/IN2P3-Helmoltz DMLab.

The above-mentioned hardware contributions have been realised thanks to the strong and well-balanced commitments between engineers and physicists. The participation to the hardware work also represents a very good opportunity for PhD and young researchers to get involved in a technical project.

The link with theorists, astrophysicists and particle physics colleagues in the context of national and international projects (DMLab, PHC, IEA and others), also represents a good opportunity to strengthen existing collaborations, to build new ones and to attract new resources in view of reinforcing the team in the future.

Weaknesses and risks linked to the context

The size of the team is quite small and may represent a threat to the success of the CPPM contributions to the DarSide-20k and MadMax projects since they both require a large investment in terms of R&D, hardware, simulations and software developments for the team members. In particular, the retirement of one engineer next year risks to become critical for the group commitments in MadMax.

The limited number of members is also critical to participate to outreach/general public sharing knowledge activities, for which so far, the team's contributions are very limited.

Among the members of the team, there is only one senior professor (contributing to DarkSide with 0.2 FTE): the limited connection with academia, namely missing university professors in the team, risks having an impact on the links with future potential doctoral students.

The contribution of the group to the two collaborations relies heavily on financial support from the laboratory or resources from project calls: in the future, this could become problematic, especially as it risks impacting the planning of activities.

On a longer timescale, if the size of the team does not increase considerably, the group's visibility within the Global Argon Dark Matter Collaboration (GADMC) collaboration may shrink as this collaboration is getting larger. The CPPM contribution may become a small part of GADMC and the impact of the team within GADMC will need to be considered in the future.

RECOMMENDATIONS TO THE TEAM

The committee recognises the investment of the team members in direct matter searches and the importance of their contributions within the DarkSide collaboration and even more the success in opening an experimental activity focused on the direct search for axions, in the context of the MadMax project. The committee sees the participation to MadMax as a very good opportunity and encourages the team to primarily pursuit in this direction.
The committee recommends the team to be careful to have a volume of scientific and technical activities commensurate with its size and that, without additional local or external reinforcements, the activities remain focused on the major commitments that have been made to date.

The committee invites the group to continue the efforts in searching and diversifying its sources of funding for doctoral and postdoctoral fellowships. It recommends that the team applies for grants (EU Marie Curie programs, ANR, …), which can provide further opportunities and strengthen the network both at national and international levels.

In order to further enhance its attractiveness, the team is encouraged to increase its involvement in teaching and outreach activities. Care should be taken to intensify contacts with master students and facilitate their subsequent recruitment as doctoral students.

Team 5: Neutrinos

Name of the supervisor: Mr Vincent Bertin

THEMES OF THE TEAM

The team is dedicated to (astro)particle physics with neutrinos under three aspects: (i) high-energy neutrino astronomy (ii) multi-messenger studies with these neutrinos and (iii) studies on fundamental neutrino properties. The scientific topics are embedded in and based on strong participation in (large-scale) experimental infrastructure and facilities. The focus here is on the construction, installation and maintenance of the French site (Orca) of KM3NeT (as successor to the now-discontinued ANTARES experiment).

The activities at KM3NeT are accompanied by the smaller SVOM spatial detector and COLIBRI telescope to support the multi-messenger studies, as well as P2O long baseline project and SuperNEMO work to provide a broader view of neutrino properties.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The most important recommendation of the last evaluation concerned the fact that the neutrino team must be careful not to get bogged down. In terms of key tasks, Orca/KM3NeT is the flagship experiment of the CPPM. It is essential that the team fulfils the many commitments it made in commissioning the (MEUST) infrastructure, building and operating the detector, in order to retain a leading role, or better, in the scientific analysis of the data.

The team has responded to this recommendation that the priority of the neutrino group and the majority of its activities are indeed still related to the construction and operation of the KM3NeT/Orca detector and its underwater infrastructure. Initiatives have been taken to obtain additional funding for this project through CPER, PIA4 and PEPR applications. It is not clear to the committee how successful and, more importantly, how sustainable these programmes can be in helping to maintain this leadership role.

The committee is aware of the need to expand data analysis to multi-messenger studies these days in order to be successful and visible. The team is taking this approach through new involvement in activities such as SVOM and COLIBRI. In principle, this is a good approach, but the question is whether this does not distract too much from the main task.

The second recommendation, concerning participation in the JUNO experiment, was aimed in the same direction. Here, the team reduced the activities in JUNO to a marginal contribution by a group member, which is even closely related to his/her unique expertise and is also of interest for the SuperNEMO and other experiments. The committee is more critical of the activities towards P2O, where not too much effort should be put in. On the one hand, because the project is in the very distant future, and on the other hand, because this future is very uncertain due to the current active sanctions against Russia. The group has reacted to these circumstances by elaborating other possibilities of connection between neutrino beams and KM3NeT.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	3
Scientist (Chargé de recherche, CR) and associate	3
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	16
Subtotal permanent personnel in active employment	**23**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	3
Post-docs	3
PhD Students	6
Subtotal non-permanent personnel	**12**
Total	**35**

EVALUATION

Overall assessment of the team

The team is performing excellent work and is the central group in the IN2P3 flagship experiment KM3NeT. In terms of astroparticle physics of high-energy neutrinos, the team is one of the world's leading and most visible institutes.
A major achievement of the team is the installation and operation of the LSPM platform, with the milestones of becoming a National Platform IN2P3 (April 2020), getting the Technological Platform Label Amu (November 2021) and a UAR of CNRS in October 2022.
At KM3NeT, the team provides the host laboratory for Orca and is thus responsible for the operation of the seafloor infrastructure, including all contacts with the associated industry. The team is also responsible for the calibration and operation of the Orca site and parts of the reconstruction pipelines, resulting in detailed physics analyses.
Finally, the scientists of the team have leading positions within the international collaboration. However, this strong taking on of major responsibility within the research infrastructure could cause reduced activities in other areas of the team's work, such as multi-messenger or society liaison.

Strengths and possibilities linked to the context

Due to its size (in FTE including the staff of engineers and technicians) and its history (by decade-long work on Antares) the team has a broad portfolio, where all activities are based on excellent expertise.

It must be emphasised that the technical work (submarine infrastructure and installation of Orca) is currently in the foreground and requires a lot of energy and work not only from the technical staff but also from the scientists, i.e. the whole team. The team has been a key contributor to KM3NeT being a European ESFRI project and the submarine infrastructure being recognised as a French national platform and meanwhile also a UAR of CNRS.
It is therefore noteworthy that the analysis of the ANTARES data is also continuing, with correspondingly valuable publications. In addition, the expertise and access to multi-messenger studies will be maintained for the team (SVOM and COLIBRI), the historical expertise will continue to be made available to the community (SuperNEMO), and the capabilities of KM3NeT (for oscillations and P2O) will be elicited with scientific studies.

All this work is not only carried out, but also translated into visible publications, which is a great strength of the team. This, together with the team's leadership positions in the international collaboration (the team provides the KM3NeT spokesperson and working group leaders), makes the team an eminently important part of global neutrino astronomy.

Based on these strengths, the team has great potential to be at the forefront of exploring, shaping and very visibly publicising KM3NeT's promising scientific prospects and opportunities in neutrino physics as a team. This automatically also gives it the chance to be very attractive to young scientists worldwide.

In the area of society connections, the team's strengths lie in the national platform and corresponding contacts with industry.

Due to the high attractiveness of the unique instrument of an underwater detector, there is a great potential in the area of outreach and communication with society that should be exploited.

Weaknesses and risks linked to the context

Despite the relatively large size of the team compared to other teams, the Neutrino team is too small considering the portfolio and especially the responsibilities taken on. This is both a weakness and a risk.
If certain people with their expertise and responsibility are removed from a position in both science and technical parts of the team, the team structure will become unbalanced, which in turn can reflect on the entire international collaboration.
In addition, the relatively small number of permanent scientists makes it also difficult to supervise a larger number of early career scientists.

Another weakness and risk for the team lies in the global situation of Orca's funding. The uncertainty of the lack of through-funding of KM3NeT poses problems for the team in that well-rehearsed processes in production and deployment can be interrupted and thus also disrupted. This in turn can lead to significant delays and increased costs.

The large and important activities in the construction and installation of the detector also entail the risk that the activities with socio-economic relevance might have to be reduced due to time constraints. This risk shall be minimised.

RECOMMENDATIONS TO THE TEAM

The team must continue to play a visible and leading role in the KM3NeT collaboration, both scientifically and technologically, and in the construction of the detector. As the mostly responsible group and host for Orca, an even more insistent focus on these activities is urgently needed. After the completion of the installation of Orca, an adjustment of activities towards maintenance and operation can and should be considered in order to maintain the international leadership role.

The team should investigate to what extent the industrial contacts can be used scientifically, both in the area of technical aspects of underwater deployment and in the sense of possible transdisciplinary science (possibly in the framework of the national platform LSPM). This requires close cooperation between technical and scientific personnel and can be used not only scientifically but also as a society-oriented activity.

Activities in related areas, such as multi-messenger studies or the use of internal expertise for other experiments, as well as studies on the further exploitation of KM3NeT's capabilities should be continued to the extent necessary to maintain scientific visibility.

The team should also become more visible in the area of traditional outreach, training and communication with the community, possibly through better cooperation with other teams in CPPM or using already existing national or local structures.

Team 6: Photons

Name of the supervisor: Ms Heide Costantini

THEMES OF THE TEAM

The PeV galactic cosmic ray sources with CTA, known as PeVatrons, and the micro-quasars with H.E.S.S. are the main scientific interests of the team.

The team is composed of three permanent researchers (a professor, a lecturer and a research engineer), two software engineers, two PhD students and an '*apprenti*'. The permanent researchers of the team are former ANTARES/KM3NeT CPPM physicists willing to enlarge their scientific activities by including high-energy gamma ray studies.

Since 2014, the group's professor has been involved in H.E.S.S., which is the current generation 'Imaging Air Cherenkov Telescope' (IACT) instrument located in Namibia. In H.E.S.S., the team is working on the search for very high-energy gamma-ray emission from galactic binaries, in particular micro-quasars. Moreover, the team is the main contributor to the CTA PeVatron working group, aiming to define an efficient criterion to identify the best PeVatron candidates during the CTA Galactic Plane Survey (GPS), which is one of CTA's key science projects.

The study and development of the software and of the associated infrastructure needed for data acquisition of the telescope cameras at the CTA-North site and Monte Carlo simulations are among the important contributions of the team to CTA.

The team is also participating in ALTO-COMET project, aiming to design a wide field-of-view VHE gamma-ray detector.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The committee that has conducted the previous evaluation noted that the number of scientific themes covered by the team was rather large given its size. It recommended that the team continue its efforts to increase its attractiveness and diversify the sources of funding for post-doctoral fellowships.

It also recommended that the team increase its scientific impact by intensifying its collaborations with teams geographically close to it, working on the same themes.

To meet these recommendations the team has made efforts to increase its attractiveness and consequently the number of team members. A research engineer and two post-doctorate joined it in 2017. A new post-doctorate is expected to join the team for the period 2022–2024. With this reinforcement, the group could intensify its collaborations with other groups.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	1
Senior scientist (Directeur de recherche, DR) and associate	0
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	3
Subtotal permanent personnel in active employment	**5**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	2
Subtotal non-permanent personnel	2
Total	**7**

EVALUATION

Overall assessment of the team

The Photons team was created in 2010 by permanent staff of the Institute who has gradually moved from high-energy neutrino physics (ANTARES) to gamma-ray astronomy (H.E.S.S and CTA).

The team is today specialised in high-energy gamma-ray astronomy with the ground-based detectors H.E.S.S and CTA (Cherenkov Telescope Array).

The team's activity, initially instrumental, is gradually extending towards physics simulations and the preparation of future data analysis for the study of astrophysical sources. The search for PeV galactic cosmic ray sources with CTA, known as PeVatrons, and the search for micro-quasars with H.E.S.S. are the main scientific interests of the team.

Given its scientific experience, the team will be able to perform scientific analyses of the H.E.S.S. and CTA data and in the future combine these results with data obtained by the ANTARES collaboration.

The team could initiate multi-messenger analyses, combining photo and neutrino data. This type of analysis could open a new window in our knowledge.

Strengths and possibilities linked to the context

The team's contributions to the EventBuilder software for CTA cameras data acquisition, as well as the team's activities on the simulation and calibration, are important elements through which it has gained visibility within the collaboration. Thanks to its early involvement in the LST telescope, the team has seized the opportunity to analyse the first data from the first (LST-1) telescope in La Palma.

The recent discoveries of ultra-high energy sources (possible PeVatron candidates) in the northern hemisphere by air shower experiments make PeVatron observations with CTA in the north hemisphere very promising. The possibility of observing these sources with LST-1 in combination with the nearby MAGIC telescopes opens the opportunity to exciting physics results.

Thanks to the proximity of the CPPM neutrino group, multi-messenger analyses could be carried out. However, to achieve this objective, a better coordination of the activities of the two teams seems essential.

Weaknesses and risks linked to the context

The permanent staff of the team, a professor, a senior lecturer and a research engineer, cannot devote all their time to the scientific activities of the team. A strengthening of the team seems important and necessary in order to exploit the significant technical investment made by the team and the scientific opportunities offered by CTA.

Without a reinforcement with permanent positions, the group will probably have difficulties to fulfil its scientific obligations.

RECOMMENDATIONS TO THE TEAM

The team should continue its strong technical investment in the CTA experiment.

Its technical contributions to the camera data acquisition will enable the team to play a decisive role in the data analysis of the future CTA observations and in particular to the study of PeVatron sources. This is a very attractive goal, which should be considered by the team as its first priority.

Furthermore, the team must strengthen its collaborations with other teams working on the same scientific domain, and in particular with the CPPM neutrino team. This would make it possible in the future to carry out multi-messenger analyses.

To achieve its objectives, the team must continue to increase its attractiveness in order to strengthen itself.

Regarding the wide-field activities, the team should consider with low priority the global activities and get involved only where the existing expertise can be used meaningfully and visibly.

Team 7: Renoir

Name of the supervisor: Mr Dominique Fouchez

THEMES OF THE TEAM

The team's research themes focus on understanding the origin of cosmic acceleration, through the study of the nature of dark energy and the testing of possible deviations from general relativity at cosmological scales.

The team is strongly involved, both technically and scientifically, in the two very large projects dedicated to the study of dark energy: the Euclid space mission, which will observe from 2023 to 2030, and the LSST survey of the Rubin observatory, which will observe from 2024 to 2034. In addition to phenomenological studies, and to best prepare for the analysis and interpretation of scientific data, they have been and are involved in precursor projects: the eBOSS (2014–2019) and DESI (2021–2026) spectroscopic galaxy surveys and the HSC (2014–2021) and ZTFII (2021–2026) photometric galaxy and transient surveys.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has followed and fulfilled the recommendations made in the previous Hcéres evaluation in a particularly impressive way. The number of publications with the first authors has increased significantly. The laboratory has been able to recruit a CRCN and a Chair of Excellence and the team has increased the number of PhDs and postdocs as recommended. It has also been able to strengthen its links with the LAM and the CPT (co-supervision of theses and ANR grant).

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	2
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	4
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	7
Subtotal permanent personnel in active employment	**15**
Non-permanent teacher-researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	2
Post-docs	3
PhD Students	4
Subtotal non-permanent personnel	**10**
Total	**25**

EVALUATION

Overall assessment of the team

The Renoir team is one of the pillars of CPPM.
Not only does the team make significant technical contributions to Euclid and LSST/Vera Rubin, but they have developed a state-of-the-art scientific strategy to prepare for the analysis of the data of those projects. Among others, their major involvement in the NISP instrument gives them a central role in the fight against instrumental systematics studies for the interpretation of future data. The team is a key player in the field of cosmology, bringing together both photometry and spectroscopy skills, a unique mix to be able to best combine observations to further constrain dark energy.

Strengths and possibilities linked to the context

The Renoir team has acquired skills that can rarely be found all together in the same place.

The team has a unique positioning at the crossroads of DESI, ZTF, Euclid and Vera Rubin/LSST and have major responsibilities in all those projects. The team members are very visible in those international collaborations.

On the technical side, one can cite their expertise in the characterisation and integration of infrared detectors, including the needs to master space technology, as well as in the domain of scientific computing.

The team members are very well identified by CNES for their work on the NISP instrument which allowed them to be reinforced by the presence of CNES contractors.

The proximity of LAM and CPT offers to the team a strong opportunity to benefit from and participate to collaborations with those institutes.

Weaknesses and risks linked to the context

The team is involved in many projects. It will need to slow down its involvement in 'precursor' projects (while keeping 'niches' where it is visible), in order to guarantee a scientific return and visibility in Euclid and Vera Rubin/LSST corresponding to the important technical contributions.

Even though the next few years will be rich in data and scientific activities, the team must be vigilant in preparing for the future of Euclid and Vera Rubin/LSST before the end of these projects so that the team does not disperse once the data is analysed.

There will be two retirements this year. While those persons will ask for the '*éméritat*', it is important to ensure that the team is large enough in the coming years to make significant contributions to Euclid and Vera Rubin/LSST.

RECOMMENDATIONS TO THE TEAM

The team has a unique positioning in all the international projects aiming at studying dark energy, allowing them to be central players in the cross correlations or combinations of the corresponding data to get the most constraining results. It is strongly encouraged that the team develops further the links between the groups within the team and take responsibility in the cross-correlation and probes combinations working groups of the projects they are in.

There are already existing links with CPT and LAM, the committee encourages the team to develop them further to enhance the scientific outcomes (this could take the form of hackathons on dedicated topics for instance).

To limit the loss of expertise due to the retirement of two persons, the organisation of mentoring sessions between them and the other members of the team is strongly encouraged in order to share knowledge.

To keep the team at the forefront of international observational cosmology around 2030, the committee recommends keeping an eye out for opportunities to join other projects before the Vera Rubin/LSST and Euclid data analysis is complete.

Team 8 : imXgam

Name of the supervisor: Mr Christian Morel

THEMES OF THE TEAM

The ImXgam team deals with the development of innovative imaging techniques based on X and gamma radiation. It is an interdisciplinary activity based on hybrid pixels developed for Cern experiments. The historical field of application is health and more recently nuclear decommissioning. The group is involved both in instrumental developments (systems with hybrid pixels sensors and electronics with high temporal resolution – <10ps – for hadrontherapy applications) and in reconstruction algorithms design for material basis decomposition in the frame of spectral computed Tomography.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has met some of the recommendations made in the previous Hcéres assessment:

The research level is still very high and the team is involved in fruitful collaborations with IN2P3laboratoriess, INSERM, Cern, and CEA… The links with academic medical societies and socio-economical partners in the medical field are strong.

The previous Hcéres advice was to go on the activities on the same model. It was performed. The team is involved in collaborative projects, it welcomes many students and encourage the redaction of articles, the talks giving in conferences, etc.

The previous Hcéres evaluation recommended reinforcing the team with the support of Amu or in applying to European funding with non-permanent positions: the increase of support from Amu does not seem to be effective but a postdoc was got from a European project.

The previous Hcéres evaluation recommended participating actively in the definition of the technical profiles for the CPPM technical resources recruitment. The point is not addressed precisely in the present report, but the team asserts its proximity with the unit direction on this matter.

The way of attribution of support from the technical services of the laboratory is not addressed in the report.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	1
Senior scientist (Directeur de recherche, DR) and associate	0
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	1
Subtotal permanent personnel in active employment	**3**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	2
Subtotal non-permanent personnel	**3**
Total	**6**

EVALUATION

Overall assessment of the team

The imXgam team got impressive results in biomedical imaging new developments. It is a remarkable activity. The technological transfer of expertise from high energy physics instrumentation to health applications showed remarquable achievements despite the small size of the team. The support of the CCPM technical departments is essential in these projects and must go on. The team is involved in many visible local, national and international collaborations. The team contributes to education with a high number of PhD students. It has lots of papers, many of them as the main author and a lot of talks in international conferences.

Strengths and possibilities linked to the context

The ImXgam team has an established and solid reputation in the biomedical applications. It has a high number of students. The team is involved in many high-level projects both in instrumentation and in analysis. Thus, everyone can find an interesting activity for himself while he participates to a full achievement, from simulation to measurement through the design and production of breakthrough instruments. CPPM has high-level facilities for nuclear medicine and radiography which is very attractive.

The ImXgam team is seventeen years old with impressive scientific and technical achievements. It has led pioneering work to develop X-ray photon counting (PC)-computed tomography (CT), both from the instrumentation point of view and from the development of methodology for material basis decomposition. The imXgam team has also significantly contributed to the development of high-bandwidth data acquisition electronics for the imaging of prompt gammas in hadrontherapy.
During the evaluation period, the team was involved in 2 projects now ended: CLaRyS-UF for the on-line control of secondary radiation hadrontherapy with very high temporal resolution (<100 ps) and TEMPORAL for the development of a Compton camera for the dismantling of nuclear equipment. Nowadays, the team coordinates the DePIcT project for the development of deep-learning data processing of spectral PC-CT longitudinal studies (laureate of the 80Prime programme of the MITI – Interdisciplinary Mission – of CNRS. Il also collaborates to 3 other projects: ClearMind for the development of a scintronic crystal for ultrafast gamma-ray imaging applications, TIAra for the development of a time-of-flight imaging array for real-time monitoring in hadrontherapy, MAPSSIC for the development of positron probes for imaging in awake, free-moving small animals.
The team publications – most of them in peer-reviewed journals – and talks/posters in conferences are impressive with a high level of participation for the students which shows a very good commitment of the team for education. One HDR was defended on the PIXSCAN prototype scanner project.

The team has a strong interaction with social-economical health partners and with academic health partners – most of its former students are recruited by hadrontherapy developments companies. One CIFRE PhD is ongoing and the team is building links with local companies to fund other CIFRE theses.
The CPPM ImXgam spin-off company ImXPAD has ceased its activity but Cegitek Innovation has taken over its commercial activities. It manufactures and sells hybrid pixel cameras for X-ray photon counting based on the CPPM XPAD3.2 chip.
The reconstruction algorithms designed for material basis decomposition in the frame of spectral CT are now used for research on cancer and the clinical CT scanners use the Spectral CT which is a major achievement in imaging and a successful transfer of technology.

Weaknesses and risks linked to the context

As it is said in the team report, there was no CNRS researcher recruitment in this team. Hence it is an active but still a small team. The future retirement of its leader should complicate things.
It is a concern not only for the team visibility but also to maintain the ongoing involvement.

During the previous Hcéres evaluation, the large numbers of parallel projects were noticed.
The configuration is the same. So the team must carefully study its impacts in the projects to ensure its visibility. For sure, the great capacity of the team to recruit PhD students and to give them high visibility both in academic fields – papers, conferences – and in the social-economical field is an asset.
But the team production is insured by many people with non-permanent positions which is a threat to the perennity of the knowledge and to maintain a high level in technical skills.

RECOMMENDATIONS TO THE TEAM

The team should seek for a CPPM researcher with part-time involvement. It could be achieved by discussion with the people involved in the instrumentation development valued by the ImXgam team. One other possibility could be to attract part time of a senior CPPM instrumentation engineer, capable of carrying projects. Of course, involvement in projects with non-permanent positions funding is essential too.
The involvement in the projects could be focused on some subjects with a strong attention on both the scientific or technical interest of the team and its visibility in the projects. The CPPM valorisation person should be involved in the preparatory phases to evaluate the potential transfers to the industry of the different projects and help to choose them according to this criteria.
The team should choose involvement in projects with engineers or researchers long-term non-permanent position funding, with, mainly for the engineers, the possibility for the CPPM to stabilise them.

CONDUCT OF THE INTERVIEWS

Date(s)

Start: 13 novembre 2022 à 19 h 00

End: 16 novembre 2022 à 14 h 00

Interview conducted: on-site

INTERVIEW SCHEDULE

Sunday, November 13

8 p.m.	Committee dinner

Monday, November 14

8:30 a.m. – 9 a.m.	Committee closed meeting
9 a.m. – 10:30 a.m.	Plenary session - Presentation of the committee members 5 min - Presentation of the director: general overview of the laboratory, 50 min; questions 35 min
10:30 a.m. – 10:45 a.m.	Coffee break
10:45 a.m. – 12 p.m.	Atlas - Presentation 40 min; questions 35 min - Team members
12 p.m. – 12:45 p.m.	Photons - Presentation 30 min; questions 15 min - Team members

12:45 p.m. – 2 p.m.	Buffet/poster session with leaders of technical services, and platforms

2 p.m. – 3 p.m.	LHCb - Presentation 30 min; questions 30 min - Team members
3 p.m. – 3:45 p.m.	Dark Matter - Presentation 25 min; questions 20 min - Team members
3:45 p.m. – 4 p.m.	Coffee break
4 p.m. – 5 p.m.	Meeting with researchers and academic staff
5 p.m. – 6:45 p.m.	Presentation of technical/engineering activities by the technical director 30 min Visit of laboratory and experimental areas and platforms 1:15 a.m.
6:45 p.m. – 7:30 p.m.	Committee closed meeting

20h	Committee Dinner

Tuesday, November 15

8:15 a.m. – 9:30 a.m.	Neutrinos - Presentation 40 min; questions 35 min - Team members
9:30 a.m. – 10:15 a.m.	Belle 2 - Presentation 25 min; questions 20 min - Team members
10:15 a.m. – 10:30 a.m.	Coffee break
10:30 a.m. – 11:45 a.m.	Renoir - Presentation 45 min; questions 30 min - Team members
11:45 a.m. – 12h30	imXgam - Presentation 30 min; questions 15 min - Team members

12:30 p.m. – 1:45 p.m.	Buffet/poster session with leaders of research teams

1:45 p.m. – 2:45 p.m.	Meeting with engineers, technicians and administrative staff – IT and BIATSS –
2:45 p.m. – 3:45 p.m.	Meeting with doctoral candidates and postdocs
3:45 p.m. – 4 p.m.	Coffee break
4 p.m. – 5 p.m.	Meeting with the supervising bodies: Amu, CNRS
5:15 p.m. – 6:15 p.m.	Meeting with CPPM director

20h	Committee dinner

Wednesday, November 16

9h – 13 h	Closed session: Work of the committee – writing of the report

PARTICULAR POINT TO BE MENTIONNED

None

GENERAL OBSERVATIONS OF THE SUPERVISORS

Le Président de l'université

au

Département d'Évaluation de la recherche - Hcéres

Objet : Observations de l'unité relatives au rapport d'évaluation des experts Hcéres
N/Réf. : VPR/LS/AMS/CM – 23-06

Dossier suivi par : Cécile Merle
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Vos réf :
DER-PUR230023046 - CPPM - Centre de physique des particules de Marseille

Marseille, le jeudi 11 mai 2023

Madame, Monsieur,

Je fais suite à votre mail du 12/04/2023 dans lequel vous me communiquiez le rapport d'évaluation Hcéres de l'Unité de Recherche CPPM - Centre de physique des particules de Marseille.

Comme demandé dans ledit mail, je vous indique que les tutelles du CPPM, Aix-Marseille Université et le CNRS, n'ont pas d'observation à formuler.

Vous souhaitant bonne réception des présentes,

Je vous prie de croire, Madame, Monsieur, l'expression de mes respectueuses salutations.

Eric BERTON

The Hcéres' evaluation reports are available on-line:
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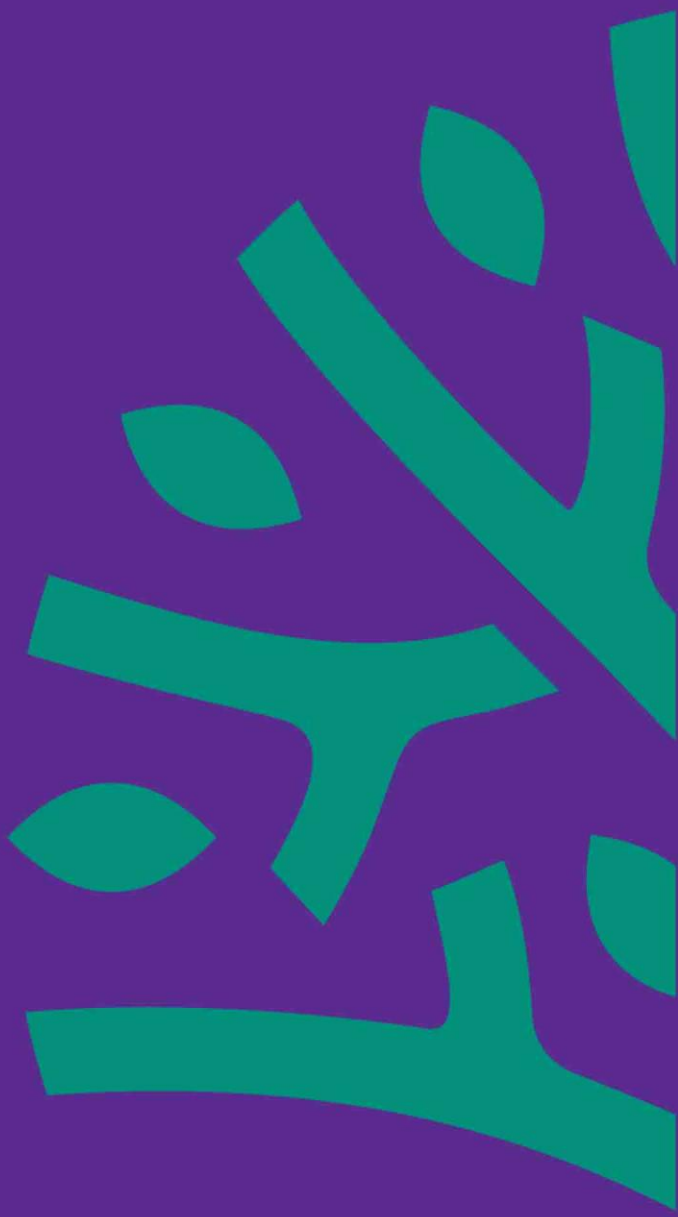

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