Institute for the Physics of the Universe

Strengthen and structure our synergies
to better teach, do research, and transfer

Aix*Marseille université
Socialement engagée

A*Midex
Initiative d'excellence Aix-Marseille

INVESTIR L'AVENIR

Aix*Marseille université
Initiative d'excellence

cnrs

Inserm
La science pour la santé
From science to health

cea

IRD Institut de Recherche pour le Développement FRANCE

CENTRALE MARSEILLE

sciencespo.aix

AP HM
Assistance Publique Hôpitaux de Marseille

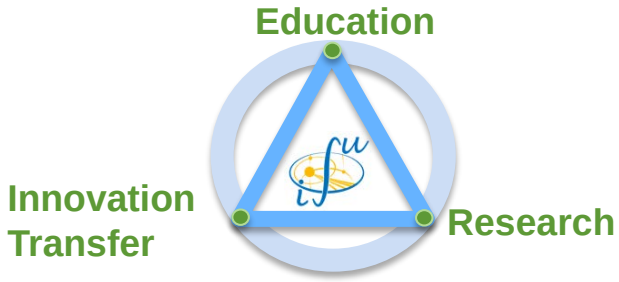
Goals and vision

Collaborative environment positioned at the best international level

- **Leverage** in excellence and synergies of its 3 constituent laboratories based on the success of the OCEVU Labex (2012-2019)
- **Encourage** and **support** ambitious joint actions and projects to:
  - Lift scientific and technological barriers
  - Push the limits in understanding the Physics of the Universe

  → **Research Groups**
- **Foster**
  - Training by and for Research → **Graduate School**
  - Innovation, Creativity, C*oopetition* → **Innovation Cell**
  - Open to the world → **Centre International de Rencontres de Physique**
- **Promote and enforce**
  - Crossed fertilization between its 3 pillars
  - HRS4R Compliant Practices

Sustainability



Ambitious project, with no real equivalent at national and international levels created by AMU on 01/01/2020

Perimeter

RESEARCH LABORATORIES (in alphabetic order)

- **CPPM** – UMR 7346 : Centre de Physique des Particules de Marseille
- **CPT** – UMR 7332 : Centre de Physique Théorique
- **LAM** – UMR 7326 : Laboratoire d'Astrophysique de Marseille

COMPONENTS

- **Faculty of Sciences**
  - Physics Department
    - » Master Degree programme in Fundamental Physics (FunPhys)
- **OSU Pythéas** : OHP (Haute Provence Observatory)

DOCTORAL SCHOOL

- **ED 352** – Physics and Sciences of Matter

CNRS

- **3 Institutes** – IN2P3, INP, INSU

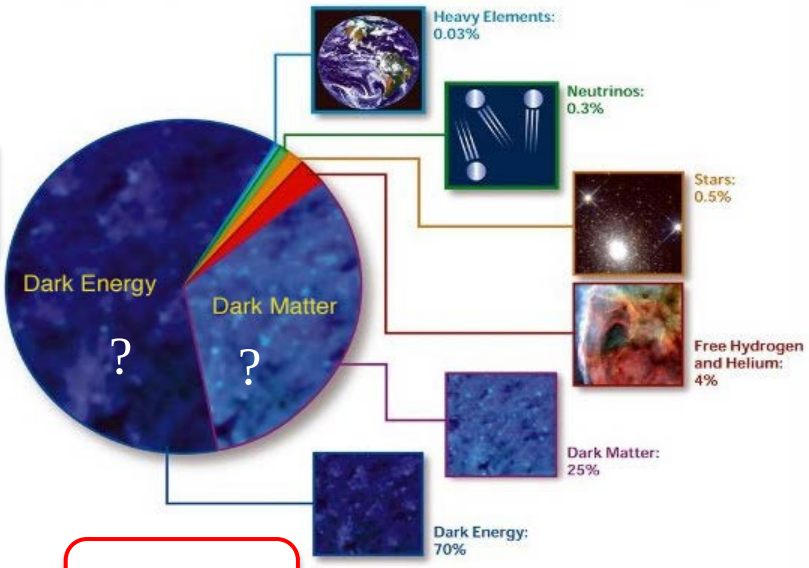
DRIVING FORCES

- **210 staff (110 HDR)**: 100 scientists, 110 engineers, techs and admins

  note: 50 out of the 110 HDR currently supervise one (or 2) PhD student(s)
- **35 postdocs, 65 PhD and 70 Master students** *on average*

Research

What are the fundamental laws governing the Universe?
What is it made of? How did it form and how does it evolve?
Do we understand the Universe in its extreme states?



Support for international projects
to ensure maximum scientific return

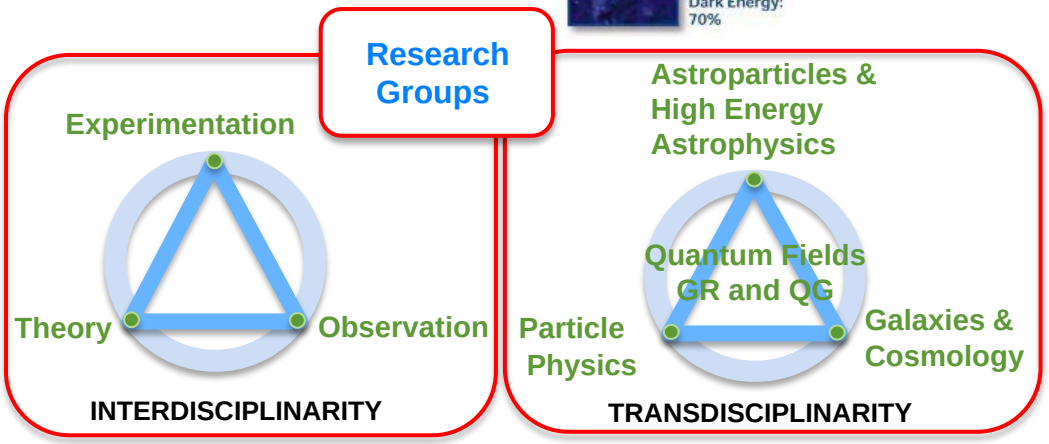
Support for original, innovative or risky ideas

- ***Transversal projects***:
  dark matter & energy, neutrinos, gravitational waves...
- ***Big Scientific Data***:
  data management, processing and analysis issues
- ***Innovative or risky projects***:
  incubation of potential future large projects

Priority to projects developing our synergies on international projects

International Hiring and Hosting Programs

- PhD students (*and no more Postdocs*)
- High-level guests from science/technology/education



Development of state-of-the-art equipment and platforms: KM3NeT/ORCA, GFT-Colibri; SPATIAL & POLARIS platforms and Instrumentation for the extreme; Radon and Infrared sensors technological platforms; CeSAM; Dark Energy Center; IRiS and ePERON platforms; Haute Provence Observatory (OHP) …

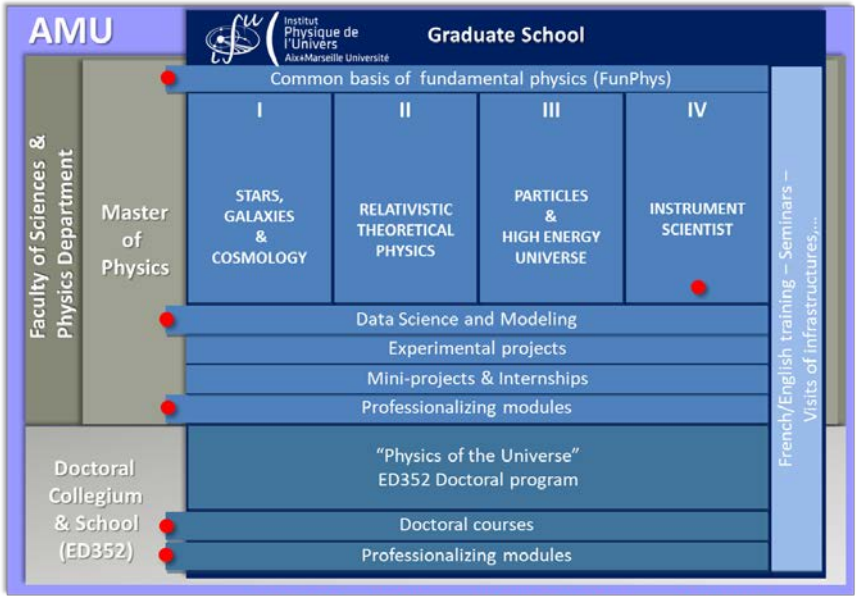
Which will also be used as training platforms in the Institute Graduate School

Education/Training

Graduate School

Program of internationalized courses

4 flavors, including a new "instrument scientist“,
Direct connection to the Research Groups of the Institute



Innovative educational offer

- Develop skills, autonomy and a sense of belonging
- Work in teams and learn by projects; access to research platforms
- Integrate into research teams, including abroad
- Participate in training and scientific dissemination actions

Link with related trainings - with strong involvement of the Grad School's students

- Physics Summer Camps/Schools
- IRiS and ePERON training platforms (radio@OHP ?)
- Research and Discovery Internships in IPhU labs and abroad
- Communication/information/support gateways between Bachelor, Master and PhD students

Development of teaching and research links with other Universities

- Innovative pedagogy - contacts with UCL (University College London)
- Contacts with **Barcelona** AU, **Bologna** Univ. and **Bucharest** Univ. (**CIVIS**) to structure a common Erasmus adventure (ERASMUS+, ERASMUS MUNDUS)
- But also with: Penn State (USA), **UNAM** (Mexico), **UCAS**(IHEP, NAOC), USTC, **THU, PKU**, SDU, **SJTU**, SYSU (China)
  [IRL ERIDANUS] *[IRL FCPPL]*
- **Strengthen present collaborations, but open to develop new ones in accordance with AMU priorities**

Socio-economic links

World of knowledge

Amplify the dynamics of scientific dissemination and mediation

- **Weave** multiple links between the places where science is produced and the various actors in society
- **Produce** multimedia resources and organize events and actions for these audiences
- **Foster** OHP, and IRiS and ePERON (radio@OHP ?)… educational platforms as training infrastructure
- **Create** a space for exhibition and exchange with secondary school teachers and the general public

World of technology

Amplify links with industry and the regional economic actors

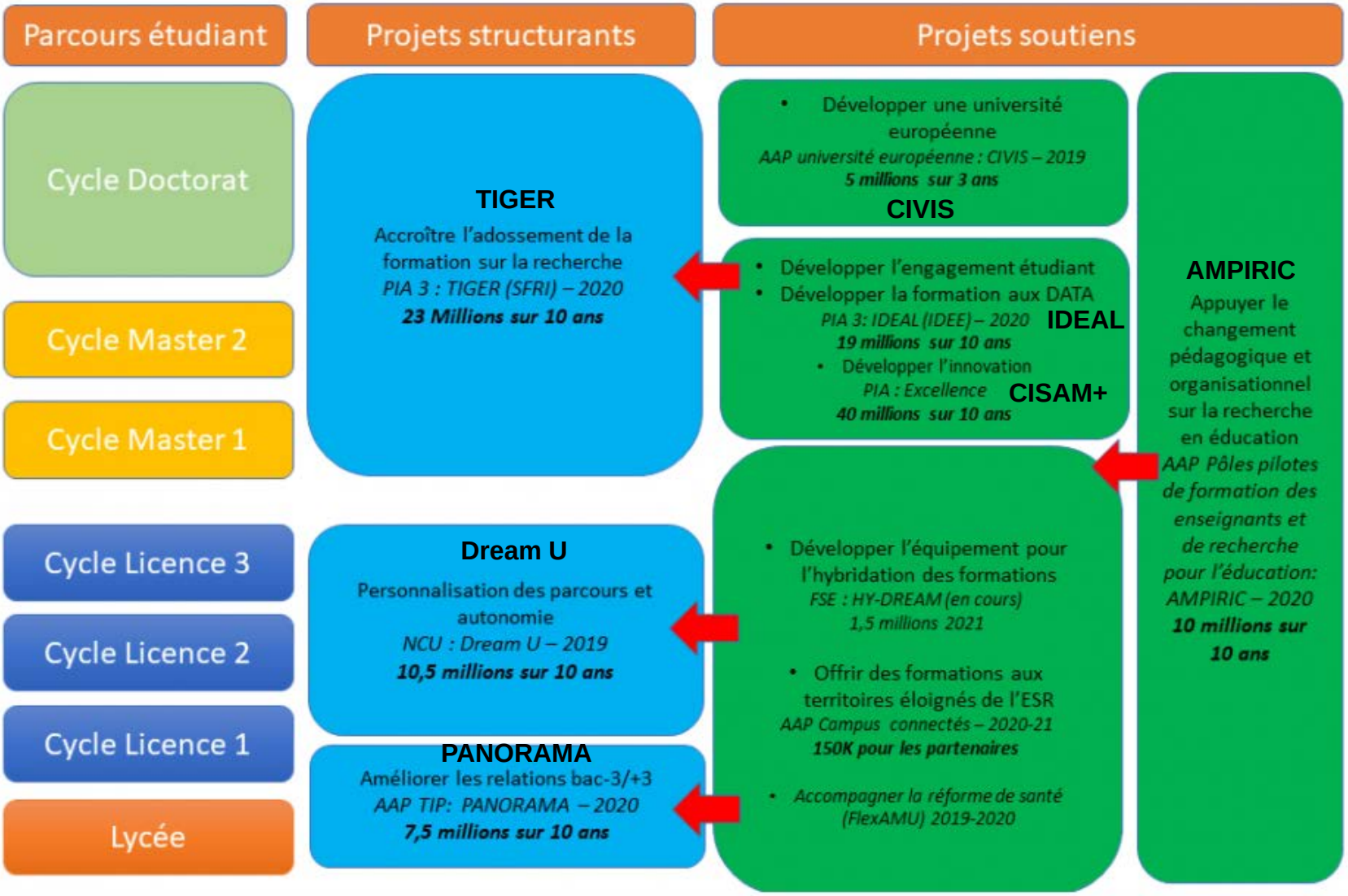
The Innovation Cell - in connection with CISAM, SATT, Competitiveness Clusters, etc. - will offer to innovative project leaders: individualized coaching, advice by groups of industrial and academic experts, adapted training, seed and pre-maturation funding, etc.

First concrete paths already being explored

- **LabCom and Partnerships with identified companies** to develop Design of spectrographs for large cosmological survey projects**,** Characterization of infrared sensors, Data acquisition and AI developments on FPGAs,… (Lynred, Thalès, Winlight, Intel/FPGA, Nexvision,…)
- **Seminars, Internships and PhD grants linked to the « Instrument scientist » flavor**

IPhU in the AMU PIA Context

A strategy based on the articulation of different structuring training projects



TIGER (1)

(https://www.univ-amu.fr/fr/public/pia-3-projet-tiger)

Call "Transforming and Innovating Graduate Education through Research"

Accelerator of the AMU transformation strategy, based on institutes at first but now open to all master programmes, and articulated around 3 axes aimed at:

- Introducing more M&D students to research to ensure more effective training and acquisition of new skills
- Increasing their international experience (through mobility and an integrated approach to the internationalization of their curricula),
- Multiplying their opportunities to work with and learn from actors in the socio-economic world (SEW)

Transformation trajectory:
Support phase - Transformation phase - Labeling phase

Transformation tools:
Internships, incoming and outgoing scholarships, seminars, events, research projects, SEW link reinforcement (*in our case – through creation of an "Instrument Scientist" flavor as part of the Fundamental Physics Master Programme*)

Calendar:

- Opening of the call for proposals: Friday, January 21, 2022
- **Deadline for submission of intent (stage 1): February 25, 2022**
- **Deadline for submission of project proposals (stage 2): Friday, April 8, 2022**
- Announcement of winning projects: Friday, June 17, 2022
- Installation meeting of winning projects: July 2022

TIGER (2)

(https://www.univ-amu.fr/fr/public/pia-3-projet-tiger)

Call "Training and Research Interdisciplinary Platforms - TRIPs"

Specific objectives:

- make training more attractive by experimenting with a new type of platform that promotes research and interdisciplinarity,

- physically establish the institutes of the institution to increase their visibility within the Aix-Marseille site, in articulation with the CISAM+ project,

- support an effort to transform training through research via **innovative pedagogical actions accessible to Bachelor's, Master's and Doctorate students**.

Types of projects supported: **MUST** - Have a physical location, Allow training through research,

Offer interdisciplinary training projects, Set up training and/or allow the realization of student projects involving L-M-D students

Calendar:

Opening of the Call for Expression of Interest (CEoI): Friday, January 28, 2022

Deadline of the EoI (stage 1): March 15, 2022

Opening of the TRIPS call for projects (stage 2): April 4, 2022

Deadline for submission of projects (stage 2): June 03, 2022

Announcement of winning projects: July 22, 2022

Start of projects: September 2022

Target: 10 projects supported with overall budget of 1.3 M€ investment + 1.3 M€ operations

Idea: IRiS, ePERON and Radio @OHP ? To be discussed … and also with the Institute Council

Organization – Rules and Regulations

Institut Physique de l'Univers Aix*Marseille Université

Aix*Marseille université Socialement engagée

A*Midex Initiative d'excellence Aix-Marseille

University Academic Council
(Conseil Académique) - AMU

Management Council
(Conseil de gestion) - A*MIDEX

Stakeholders Steering Comittee
(Comité de pilotage des tutelles)

Scientific and Training Advisory Board

AMU	Stefan ENOCH
CNRS	Lydia ROOS -> Laurent VACAVANT

Institute Council

Members with deciding vote
Faculty of Sciences (2 votes), OSU Pythéas (1)
CPPM (1), CPT (1), LAM (1)

Board of Directors
(RST) Director **Eric Kajfasz**
Deputy Director for Education **Serge Lazzarini**
Deputy Director for Research **Stéphane Basa**
(CdP) Administrative Director **Marie-Thérèse Donel**

IPhU Management

Conseil stratégique en formation et recherche / *Scientific and training advisory board*

Fabienne Casoli, President of the Paris-PSL Observatory, Former Deputy Director of the Innovation, Applications and Science Division at CNES.

Françoise Combes, "Galaxies and Cosmology" Full Professor at Collège de France, Member of the French Academy of Sciences, Honorary Fellow of the Royal Astronomical Society - UK.

Eckard Elsen, Director for Research and Computing at CERN - Switzerland. Professor at Hamburg University - Germany.

Anne-Isabelle Etienvre, Director of the Institute of research into the fundamental laws of the Universe (Irfu) at CEA, and with University Paris-Saclay.

Guido Martinelli, Professor of Theoretical Physics at La Sapienza University Roma - Italy. Member of the CERN Scientific Policy Committee – Switzerland and of the Accademia Nazionale dei Lincei - Italy.

Teresa Montaruli, Full Professor at University of Geneva – Switzerland. Chair of the European APPEC Consortium.

Joseph Silk, Professor of Physics at Sorbonne University. Homewood Professor of Physics and Astronomy at Johns Hopkins University - USA. Fellow of the Royal Society - UK.

Christian Stegmann, Director in charge of Astroparticle Physics at DESY – Germany. Deputy-Chair of the European APPEC Consortium.

Institut Physique de l'Univers
Aix*Marseille Université

Organizational chart

v20220202

Board of Directors
(RST) Director **Eric Kajfasz**
Deputy Director for Education **Serge Lazzarini**
Deputy Director for Research **Stéphane Basa**
(CdP) Administrative Director **Marie-Thérèse Donel**

Education Board
DDE - Serge Lazzarini

Master
Marlon Barbero
Serge Lazzarini
Patrice Theulé
"Instrument Scientist" flavor
Jean-Gabriel Cuby
William Gillard

Doctorate
Véronique Buat
Cristinel Diaconu
Thierry Martin

Big Data: Cristinel Diaconu

Admin.
Finance
Véronique Roux
(Isabelle Richer)
Human Resources
Anne Porta
International relations
Brigitte Pantat

Graduate School Pedagogical Engineer
Marianne Vignolo *(until Dec 2021)*

Innovation Cell
Education, Research & Technology
Stephan Beurthey, Marc Ferrari

Centre International de Rencontres de Physique
Angélique Pèpe

IT support & Webmaster
Adrien Rivière

Research Board
DDR - Stéphane Basa

Aoife Bharucha
Damien Dornic
Stéphanie Escoffier
Lorenzo Feligioni
Chritian Marinoni
Emmanuel Nezri
Roser Pello
Alejandro Perez
Carlo Schimd
Savvas Zafeiropoulos

EDUCATION

Graduate School
Master
(2 yrs)

Doctorate
(3 yrs)

INNOVATION & TRANSFER TO SOCIETY
(w/ Innovation Cell)

Knowledge mediation
In coordination with
Thierry Botti
Magali Damoiseaux
Thierry Masson

Platforms
(IRiS, ePERON,...)
S. Basa
D. Dornic/J. Busto

From Primary Schools to BSc...

Académies, Science à l'Ecole, IPPOG, Networks, Associations, Civil society,...

Technology
Links with industry

Labcoms, PR2I, CISAM, Competitiveness clusters, SATT

RESEARCH

Astroparticles & High Energy Universe
D. Dornic
E. Nezri

Galaxies & Cosmology
S. Escoffier
Ch. Marinoni
R. Pello

Particle Physics
A. Bharucha
L. Feligioni

Quantum Fields & Quantum Gravity
Transverse actions
A. Perez, S. Zafeiropoulos, C. Schimd

Research infrastructures et platforms

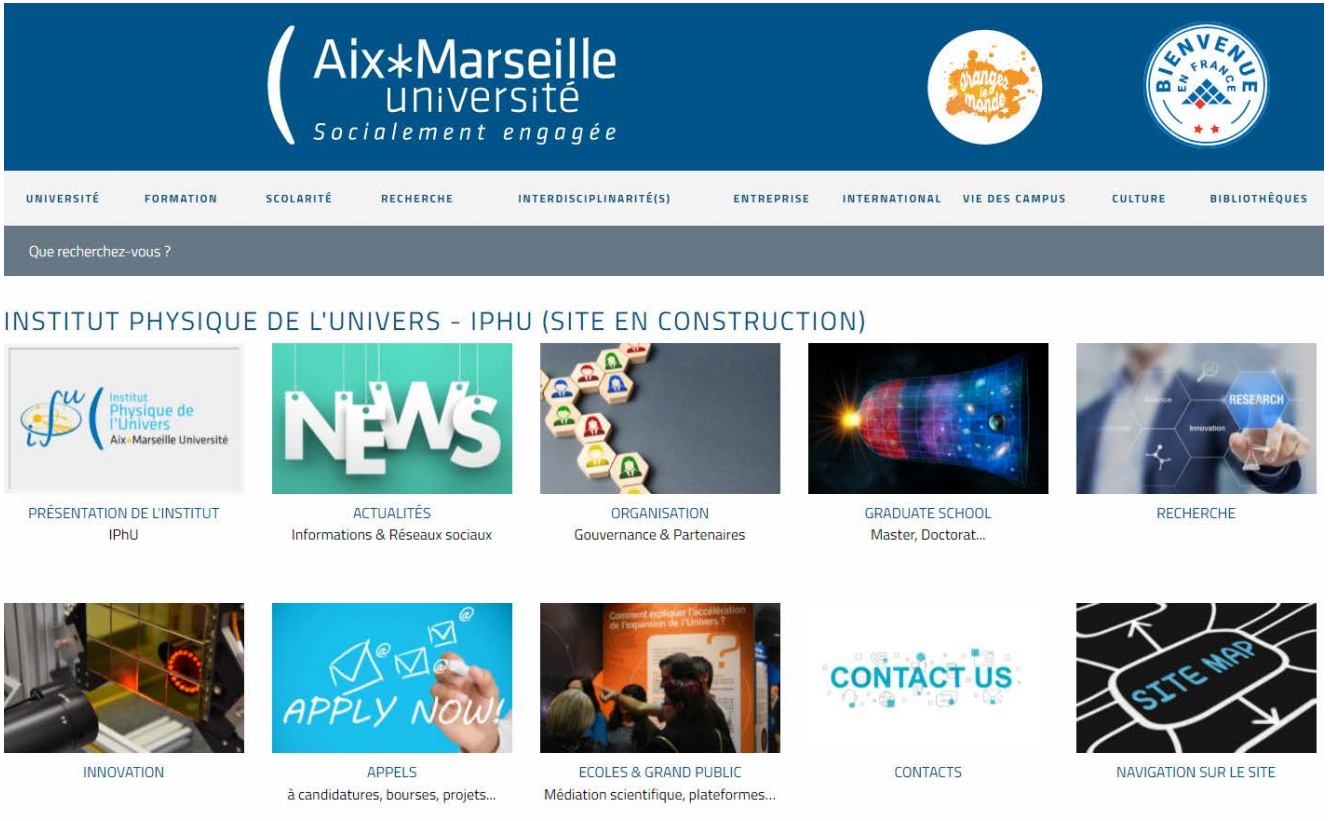
Status of year 2021-22 (1)

Context

- Solicitations from all sides and many meetings and WGs set up by A*MIDEX
  (IPhU personpower stretched pretty thin)
- We've been very active, but still in 2021, without trying to make excuses, Covid was not a facilitator

Actions

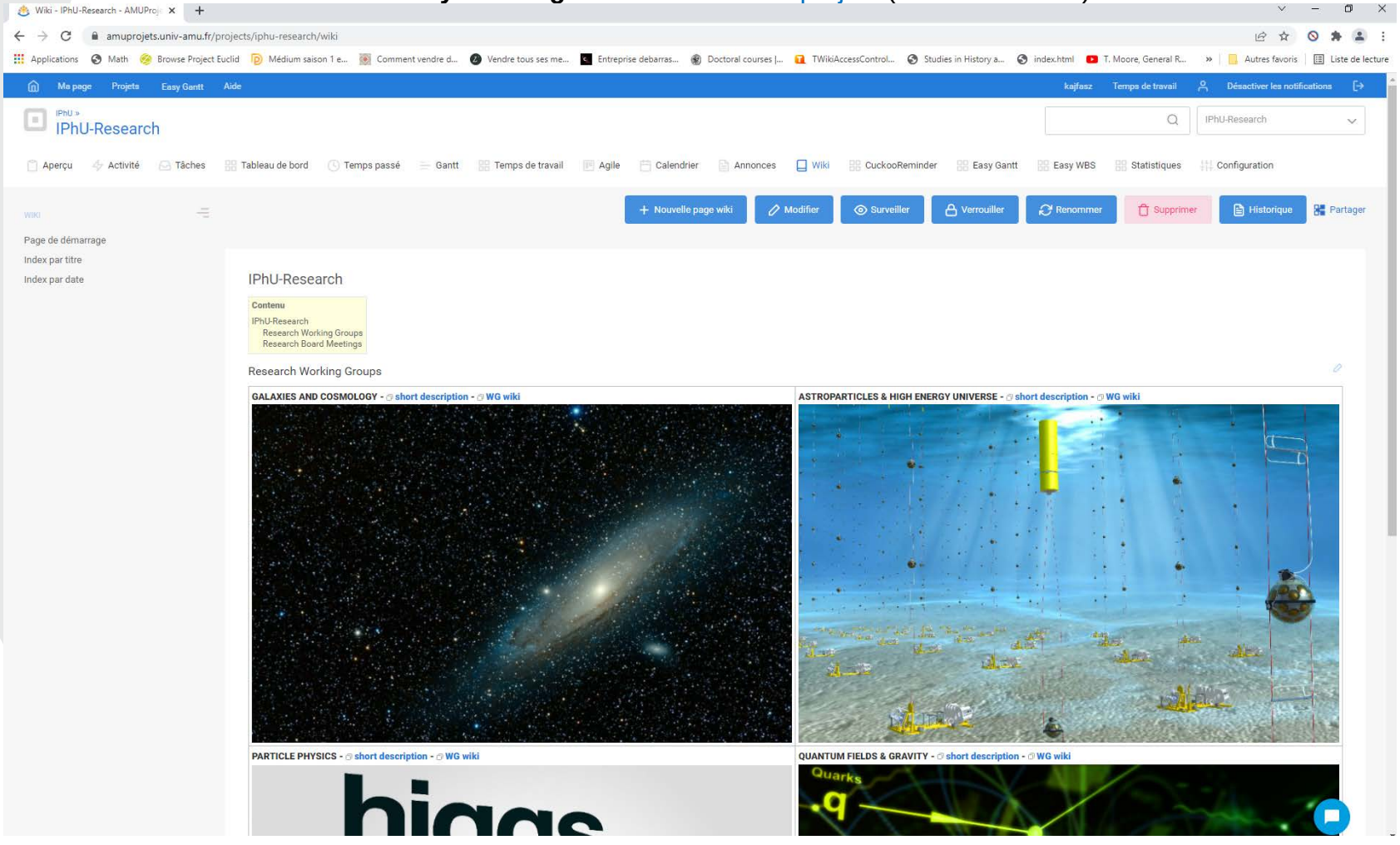
- Launched the 2021 IPhU (2nd) Call for Proposals in Nov 2020 and processed it early 2021 (Institute Council)
  Launched the 2022 IPhU (3rd) Call for Proposals in Dec 2021 and to be processed on Feb 21st (Institute Council)
- Implementation of IPhU web pages (and not a site!): https://www.univ-amu.fr/iphu
  very constraining format OK for institutional communication but need efficient & dynamical work-related one!
- Some pages are still under construction



Status of year 2021-22 (2)

Actions (cont'd)

- We developed online application forms (M1, M2, PhD,...) for the Graduate School;
  AMU did not want to share tools already developed for AMIDEX;
  too time consuming for DOSI to adapt to the needs of the institutes
- Attempt to set up collaborative tools with the help of the OSU Pythéas
  Recent discussion with DOSI finally converged: AMUbox + AMUprojets (Redmine based)



Status of year 2021-22 (3)

Actions (cont'd)

- managing meeting agendas with indico (https://indico.in2p3.fr/category/873/).

With Delphine, Christian, Alejandro…
On Gravitational Waves

Had a mini-conference – 06-07 Jul 2021 via Zoom: https://indico.in2p3.fr/event/23862/

Currently trying to organization of the 1st MaNiTou Summer School on Gravitational Waves
to be held 4-8 Jul 2022 at Luminy - with Nice (OCA/ARTEMIS) and Toulouse (L2IT, IRAP) as co-organizers
https://indico.in2p3.fr/event/25990/

Possible Scientific Project to discuss
Cloud of light particles around black holes -> superradiance – very interdisciplinary subject
Discussions with La Sapienza (Paolo Pani), Lisbon (Vitor Cardoso, Richard Brito) and Irfu (M. Besançon, Q. Baghi)
Will organize a Seminar given by Richard Brito shortly

Status of year 2021-22 (4)

Actions (cont'd)

- Implementation of a monthly Newsletter.
  AMU did not want to share its tools, so we had to manage on our own (topol.io) ...


NEWSLETTER

Institut Physique de l'Univers Aix*Marseille Université

January 2021

To you, your loved ones, and your colleagues...

Happy New Year 2021

Previous issues of the newsletter

NEWSLETTER

Where can I find them? HERE

General Event - Please join...

IPhU Days

A year after the creation of the Institute for the Physics of the Universe (IPhU) by AMU, this event aims at bringing together the IPhU community to assess the status of its beginning, its present and of its future that we need to build together in all its entangled aspects: Research, Education, Innovation and Transfer.


NEWSLETTER

Institut Physique de l'Univers Aix*Marseille Université

January 2022

To you, your loved ones, and your colleagues...

2022

IPhU Days - 10-11 Feb 2022 - Please join...

This event aims at bringing together the IPhU community to assess the status of its beginning, its present and of its future that we need to build together in all its entangled aspects: Research, Education, Innovation and Transfer.

The IPhU days also stand as an opportunity to share our expectations and discuss them among ourselves.

Please mark the dates in your calendars.

More information will be provided in January once the programme is finalized.

Hope you will be numerous to join and take part in the videoconferencing meeting.

Organized by IPhU

10-11 February 2022


NEWSLETTER

Institut Physique de l'Univers Aix*Marseille Université

February 2022

IPhU Days - 10-11 Feb 2022

Please join us on Zoom...

It is Free of Charge and No Vaccination Pass is required! ;-)

The IPhU Days aim at bringing together the IPhU community to assess the status of its beginning, its present and of its future that we need to build together in all its entangled aspects: Research, Education, Innovation and Transfer.

The programme has been finalized and is available on the indico web site you can reach just below.

This event also stands as an opportunity to share our expectations and discuss them among ourselves.

We hope you will be numerous to join and take part in the videoconferencing meeting!

Organized by IPhU

10-11 February 2022

via Zoom

INDICO WEB SITE

A*Midex Call For Proposals "Interdisciplinarité"

3 projects preselected by the Institute Council

• • •

Status of year 2021-22 (5)

Actions (cont'd) : AMU News on achievements of projects supported by IPhU

NEWS FROM AIX-MARSEILLE UNIVERSITY

April 2021

INSTITUT-IphU

BY THEMATIC

RESEARCH — **INSTITUT-IPHU**

NEW RESULTS IN THE SEARCH FOR PAIRS OF HIGGS BOSONS

Updated the: 04/07/2021 - 13:05

The Standard Model of particle physics describes the elementary bricks of matter, as well as their interaction. In this Model the particles get their masses through the Higgs mechanism.
The discovery the Higgs boson in 2012 proved that this mechanism exists but we still have to figure out its details, in particular how the Higgs boson interacts with itself.

READ MORE

RESEARCH — **INSTITUT-IPHU**

LEPTON FLAVOUR UNIVERSALITY QUESTIONED?

Updated the: 04/01/2021 - 18:13

Intriguing new result from the LHCb experiment at CERN

READ MORE

TRAINING — **INSTITUT-IPHU**

RESEARCH SCHOOL: THEORY OF GRAVITATION AND VARIATION IN COSMOLOGY

Updated the: 04/01/2021 - 18:14

Overview of current theories and tests of gravitation in different regimes, ranging from the scale of the solar system to the large structures of the Universe

START OF THE 1% SURVEY OF THE DESI EXPERIMENT

UPDATED BY ERIC KAJFASZ ON SAT, 04/24/2021 - 12:05 | INSTITUT-IPHU | THEME : RESEARCH |

AMU, with significant support from AMIDEX, Labex OCEVU and IPhU, has been involved since 2014 in the design, validation and implementation of the 10 spectrographs of the DESI experiment. The DESI 1% survey, which started on April 6, 2021 for a duration of 6 weeks, marks the beginning of the scientific exploitation of this investment.

One of the biggest questions in contemporary physics is to understand the cause of the accelerating expansion of the Universe. The expansion of the Universe has been known since the first half of the 20th century, but its acceleration was only discovered in 1998 by S. Perlmutter (Doctor Honoris Causa of AMU), A. Riess and B. Schmidt, winners of the 2011 Nobel Prize in Physics. This acceleration of the expansion of the Universe is the subject of numerous theoretical and observational studies by physicists and astrophysicists around the world.

Several large-scale ground-based and space-based projects for observing the Universe have been developed in recent years and will begin to accumulate observations in the coming months and years. Among these large international projects are the European Space Agency Euclid space mission which will be launched between late 2022 and mid-2023, the Large Synoptic Survey Telescope (LSST - Vera C. Rubin Observatory) which will become fully operational in 2022, and the Dark Energy Spectroscopic Instrument (DESI) project, led by the Department of Energy (DOE) in the USA.

Status of year 2021-22 (6)

Actions (cont'd) : AMU News on achievements of projects supported by IPhU

ANDREEV REFLECTION OF FRACTIONAL QUASIPARTICLES IN THE QUANTUM HALL EFFECT

May 2021

UPDATED BY ERIC KAJFASZ ON FRI, 05/28/2021 - 08:57 | INSTITUT-IPHU | THEME : RESEARCH |

At the interface between a normal metal and a superconductor, an incoming electron can be transmitted in the superconductor as two electrons forming a Cooper pair, while a hole is reflected back in the normal metal. This is known as Andreev reflection. Researchers from the Nanophysics team of the CPT (CNRS-AMU), in collaboration with an experimental team at NTT Research Labs (Atsugi - Japan), have demonstrated that a similar behavior can be observed for fractional quasiparticles existing in the Quantum Hall effect in 2d electronic gas. This study is an important step towards the understanding and the manipulation of these fractional quasiparticles.

In semiconductor structures, electrons can be confined at the interface between two layers, forming a 2d electron gas. Applying a strong magnetic field, and working at very low temperature, the system reaches a state known as Integer Quantum Hall Effect. There, the conductance (the inverse of the resistance) can only reach very precise quantized values. This quantization can be explained by the topological properties of the system: the electronic current is fully carried by unidimensional electronic edge states along the boundaries of the system, and the value of the conductance is directly related to the number of these edge states. If the magnetic field is increased further, one then reaches the Fractional Quantum Hall Effect. There, electronic interactions play an essential role: the current is still carried by 1d edge states, but the fundamental excitations are not electrons, but quasiparticles having a fractional charge (for example e/3, where e is the electron charge), which are due to the collective behavior of interacting electrons.

Jun 2021

ECOLE DE GIF ON " BEYOND THE STANDARD MODEL OF COSMOLOG

UPDATED BY ERIC KAJFASZ ON FRI, 06/11/2021 - 15:54 | INSTITUT-IPHU | THEME : TRAINING |

The 52nd edition of the Ecole de Gif will focus on "Beyond the Standard Model of Cosmology".
This edition is organized in Marseille by the IPhU laboratories (CPPM, CPT and LAM) on 13-17 September

The Ecole de Gif is the oldest of the IN2P3 thematic schools. Mainly French-speaking, it is intended primarily for doctoral and post-doctoral students. However, as its objective is to treat the theme of the session in its most delicate and actual developments, it is open to any interested researcher, experimentalist or theorist

BY THEMATIC

RESEARCH INSTITUT-IPHU

Jan 2022

DESI CREATES LARGEST 3D MAP OF THE COSMOS

Updated the: 01/31/2022 - 16:30

The Dark Energy Spectroscopic Instrument (DESI) has capped off the first seven months of its survey run by smashing through all previous records for three-dimensional galaxy surveys, creating the largest and most detailed map of the universe ever. Yet it's only about 10% of the way through its five-year mission.

Outstanding DESI 1st results in which teams from OHP, CPPM and LAM (IPhU Galaxies and Cosmology WG) have been strongly involved

INSTITUT-IphU

EVENT INSTITUT-IPHU

2ND EDITION OF THE IPHU DAYS

Updated the: 02/08/2022 - 10:42

The second edition of the IPhU Days will be held via Zoom on February 10th and 11th, 2022

READ MORE

Feb 2022

Status of year 2021-22 (7)

25 papers (published or presented at conferences) can already be associated to IPhU

Authors	Group	Article Title	Source Title	Pub.Year
Aaij, R, et al.	LHCb	Measurement of chi(c1) (3872) production in proton-proton collisions at root s=8 and 13 TeV	JOURNAL OF HIGH ENERGY PHYSICS	2022
Poulin, V; Smith, TL; Bartlett, A		Dark energy at early times and ACT data: A larger Hubble constant without late-time priors	PHYSICAL REVIEW D	2021
Codur, R; Marinoni, C		Redshift drift in radially inhomogeneous Lemaitre-Tolman-Bondi spacetimes	PHYSICAL REVIEW D	2021
Gallo, E; Kozameh, C; Madler, T; Moreschi, OM; Perez, A		Spherically symmetric black holes and affine-null metric formulation of Einstein's equations	PHYSICAL REVIEW D	2021
Gremaud, B; Batrouni, GG		Pairing and Pair Superfluid Density in One-Dimensional Two-Species Fermionic and Bosonic Hubbard Models	PHYSICAL REVIEW LETTERS	2021
Borsanyi, S; Fodor, Z; Guenther, JN; Hoelbling, C; Katz, SD; Lellouch, L; Lippert, T; Miura, K; Parato, L; Szabo, KK; Stokes, F; Toth, BC; Torok, C; Varnhorst, L		Leading hadronic contribution to the muon magnetic moment from lattice QCD	NATURE	2021
Elander, D; Frigerio, M; Knecht, M; Kneur, JL		Holographic models of composite Higgs in the Veneziano limit. Part I. Bosonic sector	JOURNAL OF HIGH ENERGY PHYSICS	2021
G. Aad, et al.	ATLAS	Search for Higgs boson pair production in the two bottom quarks plus two photons final state in pp collisions at s√=13 TeV with the ATLAS detector	ATLAS-CONF-2021-016	2021
Aaij, R, et al.	LHCb	Study of B-c(+) decays to charmonia and three light hadrons	JOURNAL OF HIGH ENERGY PHYSICS	2022
Aaij, R, et al.	LHCb	Measurement of the W boson mass	JOURNAL OF HIGH ENERGY PHYSICS	2022
Aaij, R, et al.	LHCb	Observation of the suppressed Lambda(0)(b) -> DpK(-) decay with D -> K+ pi(-) and measurement of its CP asymmetry	PHYSICAL REVIEW D	2021
Aaij, R, et al.	LHCb	Updated search for B-c(+) decays to two charm mesons	JOURNAL OF HIGH ENERGY PHYSICS	2021
Aaij, R, et al.	LHCb	Search for the doubly charmed baryon Xi(+)(cc) in the Xi(+)(c)pi(-)pi(+) final state	JOURNAL OF HIGH ENERGY PHYSICS	2021
Aaij, R, et al.	LHCb	Angular analysis of <mml:msup>B0</mml:msup>-><mml:msup>D-</mml:msup>Ds+ with Ds+-> Ds+gamma decays	JOURNAL OF HIGH ENERGY PHYSICS	2021
Aaij, R, et al.	LHCb	Measurement of J/psi production cross-sections in pp collisions at root s=5 TeV	JOURNAL OF HIGH ENERGY PHYSICS	2021
Aaij, R, et al.	LHCb	Angular analysis of the rare decay B-s(0) -> phi mu(+)mu(-)	JOURNAL OF HIGH ENERGY PHYSICS	2021
Aaij, R, et al.	LHCb	Observation of a Lambda(0)(b) - (Lambda)over-bar(b)(0) production asymmetry in proton-proton collisions at root s=7 and 8 TeV	JOURNAL OF HIGH ENERGY PHYSICS	2021
Aaij, R, et al.	LHCb	Branching Fraction Measurements of the Rare B-s(0) -> phi mu(+)mu(-) and B-s(0)-> f(2)' (1525)mu(+)mu(-) Decays	PHYSICAL REVIEW LETTERS	2021
Aaij, R, et al.	LHCb	Observation of the Mass Difference Between Neutral Charm-Meson Eigenstates	PHYSICAL REVIEW LETTERS	2021
Aaij, R, et al.	LHCb	Test of lepton universality in beauty-quark decays	LHCb-PAPER-2021-004	2021
..., Marie Aubert, Julian Bautista, Stephanie Escoffier, ...		The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: geometry and growth from the anisotropic void-galaxy correlation function in the luminous red galaxy sample between redshifts 0.6 and 1	MNRAS	2020
..., Julian Bautista, Charling Tao, Sylvain de la Torre, ...		The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: one thousand multi-tracer mock catalogues with redshift evolution and systematics for galaxies and quasars of the final data release	MNRAS	2020
..., Julian E. Bautista, Sylvain de la Torre, Stephanie Escoffier, ...		The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey luminous red galaxy sample: measurement of the BAO and growth rate of structure from the anisotropic power spectrum between redshift 0.6 and 1.0	MNRAS	2020
... A. Gérardin, L. Lellouch, J. Charles, M. Knecht, E. de Rafael		The anomalous magnetic moment of the muon in the Standard Model	PHYSICS REPORTS	2020

Speaking of publications…

Within the framework of projects and internships funded or co-funded by IPhU, to comply with the ANR requests within the framework of A*MIDEX:

For any communication support (oral, displayed or digital), you should display the logo of IPhU, the logos of AMU and A*MIDEX and the logo “Investir l'Avenir”.

They are provided in a zip file as an attachment in the indico agenda, or directly here

Concerning publications – to make it easier to identify them

In the Acknowledgement section, please add the following sentence:
"The project leading to this publication has received funding from Excellence Initiative of Aix-Marseille University - A*MIDEX, a French "Investissements d'Avenir" programme (AMX-19-IET-008 - IPhU).“

In your affiliation, please add “IPhU” right after the acronym of your lab
e.g. for a CPT author it should read:
"Aix Marseille Univ, Université de Toulon, CNRS, CPT, IPhU, Marseille, France"

Would be nice if at least the **IPhU funded PhD students had IPhU mentioned in their affiliation.**

Status of year 2021-22 (8)

Graduate School

@Master Level (See Serge's talk)

- **Incoming Grants**
- **Outgoing Grant**
- **Internship stipends**
- **Project @OHP**
- **AMI (EoIC) TIGER 2021-2022 experimentation**
- **Preparation for full TIGER « Transformation » Call**
- **Preparation for TIGER/TRIPS Call**

@Doctoral Level (See Véronique's talk)

- **Started the Physics of the Universe Doctoral Programme**

Status of year 2021-22 (9)

Outreach and training platforms

- The person who was in charge of coordinating these actions left in July 2020 for other adventures ☹
- => difficulty: it should be possible to hire a new person, but costly in regards of the budget…
  as a first attempt, we will try to organize ourselves differently with the Rectorate and AMU
- @ AMU, contacts with Nicolas Claire (VP Culture Science) about:
  - L'Esprit Sorcier TV de Frédéric Courant
  - Training Platforms and Summer Schools – seem to be an interest for Summer Camps for 10th graders
- @ ESA, CNES, contacts to prepare a big event on space science with astronauts

Teaching/Training Platforms

Collaboration agreement (in the process of being written) with the Aix-Marseille rectorate on scientific dissemination activities (including platforms) for secondary school classes.

Astronomy - http://iris.lam.fr/

- **IRiS** (@ OHP) – has worked really well for some years already; involvement of a school teacher and of a PhD student
- Given the budget cuts, looking for co-funding to Regional funds for the project of an antenna @ OHP for radio-astronomy

Cosmic Rays - https://eperon.omp.eu/

- **ePERON** – @ OPM in collaboration with OMP; new complementary deployment @ OHP in 2021
- Project to use Open data from HESS/CTA (gamma) and ANTARES/KM3NeT (neutrinos)
- Identification of 2 high-school teachers interested in getting involved; involvement of a PhD student

VISIOCONFÉRENCES NATIONALES « LA JOURNÉE DES DEUX OBSERVATOIRES - RENDRE VISIBLE L'INVISIBLE »

qui ont eu lieu le Lundi 11 octobre, de 10h à 22h, pour les collégiens et les lycéens. Plus de 60 classes étaient connectées pour chacune des visioconférences. L'événement a été organisé par le rectorat d'Aix-Marseille et l'IPhU dans le cadre de la fête de la science, mettant en jeu l'OHP et l'OPM, autour des 2 plateformes IRiS et ePERON.

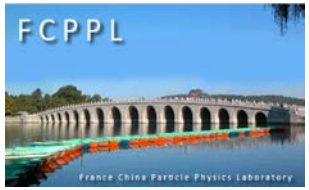
https://www.pedagogie.ac-aix-marseille.fr/jcms/c_10971943/de/visioconferences-nationales-la-journee-des-deux-observatoires-rendre-visible-l-invisible

Status of year 2021-22 (10)

International – existing structures we can rely on

LIA/IRL ERIDANUS with Mexico

LIA/IRL FCPPL with China



Ongoing discussions with AMU and DERCI to have a specific action on immunology (CIML and its IRL) and Physics of the Universe with SJTU – SII + TDLI

Innovative Training Networks (EU) to develop with partners?

ERASMUS Mundus to develop with partners?
(currently difficult to find time to start working on such a project)

Possible education partnership that we explored at the time of the IPhU proposal submission:
UAB – U. of Bologna together with U. of Bucharest (happen to be in CIVIS now)
and possibly UCL (University College London) for innovative teaching

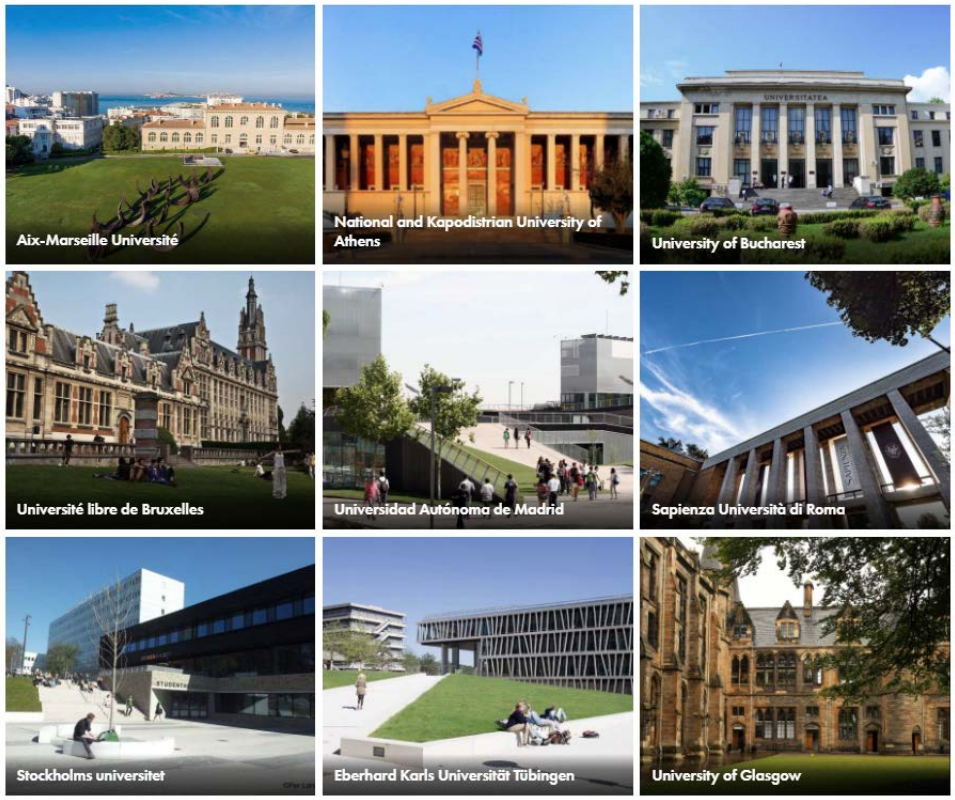
Interest of some Russian universities (*e.g.* MEPhI/IPHE) to collaborate in the framework of the Franco-Russian University

Status of year 2021-22 (11)

International - CIVIS

- Participation in several meetings organized by AMIDEX
- In the projects supported by CIVIS there must be at least 3 universities involved.
- At the training level, want to make co-degrees. At training and research level, want to support exchanges
- CIVIS of the AMU tools, but no natural collaborations for the moment and focused on themes not directly connected to our research: Health; Cities, territories and mobilities; Digital and Technological transformation; Climate, environment and energy; Society, culture, heritage
- We are in the process of looking if groups of the other 8 universities are likely to be willing to work with us. But we cannot force it.
- Currently the strongest link is with Bucharest on particle physics. La Sapienza for example on Gravitational Waves could also become a possibility…

CIVIS A European Civic University



Les réunions thématiques

https://civis.eu/en/events

Korean Studies
Law
History
Medecine
Cultural Anthropology
Pharmacy
Communication Studies
Computer Sciences
European studies
Philosophy
Classics

Translation studies
Gender equality
Education
European economic recovery

Vont avoir lieu

Les objectifs de ces réunions thématiques sont de faire connaissance avec les collègues CIVIS, d'étudier des pistes communes et de renforcer la coopération au sein de l'alliance CIVIS, en termes d'enseignement et de recherche.

Le Networking CIVIS
En moyenne 15-16 participants CIVIS dans chaque réunion

Status of year 2021-22 (12)

INNOVATION CELL (See Stephan's talk)

Interdisciplinarity/transfer

- Met with AMI – Archimède Institute to try to develop a collaboration around "embedded AI" on a concrete project; we are still waiting for feedback…
- Met with InCIAM (Créativité et Innovation) :
  - To help us free and develop creativity on the technological and training aspects in the institute
  - Specifications are being written and work meetings are being set up... to be followed.
  - IPhU could be used as a testing ground for their ANR project "Démarche Innovante Participative" (Innovative Participative Approach).
- Discussed with AMUTech about a project linked to Radon management
- Possible collaborations in coordination with LSPM with the newly created OCEAN on deep submarine instrumentation

Link with socio-economic and cultural actors

- Met with CISAM
  - participation in the 5-year roadmap of the Institute
- Met and discussed with CEO/people from a few companies: Nexvisio, Intel/FPGA, Lynred, Thalès
  Interest in working together with us and participating in the "Scientific Instrument" training of the Master's program currently under construction (through courses, seminars, welcoming trainees, even CIFRE PhD...). However, ... This has yet to be formalized and has to materialize.
- **Agreements for outreach and scientific mediation**: renewal of the one with « Science à l'Ecole » (IRiS) and the one with OMP and OPM (ePERON); New one with Aix-Marseille Rectorate still to be written

New leaflet to present the Cell to the IPhU community

Status of year 2021-22 (12)

SECOND CALL FOR PROPOSALS (2021) [1 – P & V]

V O	Samuel.boissier@lam.fr	The Low Surface Brightness universe: impact for galaxy evolution & cosmology	LAM, CPPM, CPT	3-month visitor
P,V **N**	pralavor@cppm.in2p3.fr	Direct search for WIMP dark matter	CPPM, CPT, LAM; LUPM/IFAC	salary and support (2,000€/yr) of 1 PhD student to be recruited in 2021, 2-month visit of Oleksandra Veselska and 9,000€ of operating budget
P N	stephane.arnouts@lam.fr, olivier.ilbert@lam.fr	Pix2LSST: from Pixel to Large Scale Structure with Vera Rubin Telescop	LAM, CPPM	7,000€ for the co-funding of 2 LSST tickets for 2021
P O	stephane.basa@lam.fr	Operation of the COLIBRI robotic telescope	LAM, CPPM	15,000€ of operating budget
P,V O	eric.jullo@lam.fr	Cosmology with Large Scale Surveys (CLASS)	LAM, CPPM, CPT	salary and support (2000€/yr) of 1 PhD student recruited in 2021, salary and support (2000€/yr) of 1 PhD student recruited in 2020, 1-week visit of Louis Perenon (South Africa, if sanitary conditions allow) and 20,000€ of operating budget
P O	Anton.Poluektov@cern.ch	Study of lepton flavour universality in B semileptonic decays	CPPM, CPT	salary and support (2,000€/yr) of 1 PhD student to be recruited in 2020
P,V O	lorenzo@in2p3.fr	BSM Physics at the Terascale	CPPM, CPT; L2C, LUPM; IFIN-HH (Bucharest Univ.)	6,000€ of operating budget and up to 10,000€ for several 1-month stays of Ana Dumitriu (Romania)

Status of year 2021-22 (13)

SECOND CALL FOR PROPOSALS (2021) [2 - C]

CO	triay@cpt.univ-mrs.fr	Theory of gravitation and variations in Cosmology	CPT, LAM	
CN	vincent.lebrun@lam.fr	From galaxies to cosmology with deep spectroscopic surveys - Tribute to Olivier Le Fevre	LAM, CPPM, CPT	5,000€ to participate to organization of the conference **postponed**
CN	Christian.surace@lam.fr	ASTROINFO-2021	LAM, CPPM	3,000€ to participate to the organization of the school
CN	escoffier@cppm.in2p3.fr	The science of the next generation of large cosmological surveys	CPPM, LAM; IRAP	5,000€ to participate to the organization of the school
CN	escoffier@cppm.in2p3.fr	Ecole de Gif 2021	CPPM, CPT, LAM	4,000€ to participate to the organization of the school

Status of year 2021-22 (14)
2020-2021 Budget

For 2020+2021 combined, the AMIDEX Steering Committee decided for IPhU to be allotted a global max budget of 800k€ (400+400) of direct funding

Due to Covid, a large number of expenses have been delayed or canceled in 2020 and 2021
+ uncertainty on direct budget 2022-25 and coming from TIGER made us cautious in the multi-year spendings…

Budget d'Autorisations d'Engagement

2020

	Budget	Consommations	Disponible	Taux d'exécution
Fonctionnement	77 300	75 039	2 261	97,07%
Investissement	14 181	12 635	1 546	89,10%
Personnel	52 950	28 459	24 491	53,75%
Total :	**144 431**	**116 133**	**28 298**	**80,41%**

2021

	Budget	Consommations	Disponible	Taux d'exécution
Fonctionnement	197 827	194 670	3 157	98,40%
Investissement	120 000	27 157	92 843	22,63%
Personnel	155 764	136 863	18 901	87,87%
Total :	**473 591**	**358 689**	**114 902**	**75,74%**

2021

	Budget	Consommations	Disponible	Taux d'exécution
Fonctionnement	12 635	0	12 635	0,00%
Personnel	60 504	59 326	1 179	98,05%
Total :	**73 139**	**59 326**	**13 814**	**81,11%**

Total spent = 534,148 € - Remains = 265,852 €

more on this tomorrow
remember 270k€ left

Status of year 2021-22 (15)
2020-2021 Budget (detailed)

Institut de Physique de l'Univers (IPhU) budget initial de 800k€ pour 2020+21	2020	2021
PhD 1	3	12
PhD 2	3	12
PhD 3		3
PhD 4		3
# Nombre PhDs	4	6
# mths2020	6	24
# mths2021		6
cost	15 300	77 164
PhD IA-ANR 1 (co-financement à 50%)	3	12
PhD IA-ANR 2 (co-financement à 50%)	3	12
# mths	6	24
cost	7 650	30 600
cost RH PhDs	22 950	107 764
IGE (ingénieur pédagogique de la Graduate School)	7	12
# mths	7	12
cost	18 417	33 420
IGR (innovation IR/Radon)		12
# mths	0	12
cost	0	46 620
PCA	4 000	4 000
cost	4 000	4 000
cost RH Other	22 417	84 040
COST: Human resources	dans REPORTING	dans REPORTING
PhD operation (2k€/person per yr until 2021 **and 1k€/person after**)	8 000	12 000
Research projects operations engagées		59 000
COST: Research (hors ce qui est déjà inclus dans le REPORTING)	dans REPORTING	dans REPORTING
Incoming grant S2-2020	36 000	
Incoming grant S1-2021		8 000
Incoming grant S2-2021		72 000
Outgoing grants		4 000
Internships	18 373	47 447
Training @OHP	6 000	6 000
COST: Graduate School (hors ce qui est déjà inclus dans le REPORTIN	dans REPORTING	dans REPORTING
DEPENSES FF DANS REPORTING IPhU	75 039	194 670
DEPENSES FI DANS REPORTING IPhU	12 635	27 157
DEPENSES MS DANS REPORTING IPhU	28 459	136 862
DEPENSES FF DANS REPORTING AIDOC		0
DEPENSES MS DANS REPORTING AIDOC		59 326
Total sans MS	87 674	221 827
Grand Total	**116 133**	**418 015**
Total 2020+2021 (doit être < ou = à 2*400k€)	**534 148**	

Prospects and strategy 2022+

Teaser for tomorrow …

- Strategy
- 2022-2025 Budget
- AAP IPhU 2022
- AAP AMIDEX Interdisciplinarité
- AAP AMIDEX/TIGER "Transformation de Parcours de Master"
- AAP AMIDEX/TIGER TRIPS
- AAP AMU CPJ (Chaire Professeur Junior)

On the importance of working together in these days of interdisciplinarity…

As Ava Max would sing:
We all need a soul to rely on…
A friend through the highs and the lows…
I'm not gonna make it a-la, la-la-la-la-la, la, la-la-la-la-la, 'lone! ☺

We can make it happen!