

Institute for the **Physics** of the **U**niverse



Institut
Physique de
l'Univers
Aix*Marseille Université

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



A*Midex
Initiative d'excellence Aix-Marseille



Budget Strategy before reallocation for 2022-2025

Total: ~ 320 k€/yr

Institut de Physique de l'Univers (IPhU)	2022	2023	2024	2025
PhD 1	12	9		
PhD 2	12	9		
PhD 3	12	12	9	
PhD 4	12	12	9	
PhD 5	3	12	12	9
PhD 8		3	12	12
PhD 11			3	12
PhD 14				3
# Nombre PhDs	7	8	5	4
# mths2020	24	18		
# mths2021	24	24	18	
# mths2022	3	12	12	9
# mths2023		3	12	12
# mths2024			3	12
# mths2025				3
cost	133 506	152 462	126 706	108 333
PhD IA-ANR 1 (co-financement à 50%)	12	9		
PhD IA-ANR 2 (co-financement à 50%)	12	9		
# mths	24	18	0	0
cost	30 600	22 950	0	0
cost RH PhDs	164 106	175 412	126 706	108 333
cost	51 360	0	0	0
cost RH Other	51 360	0	0	0
COST: Human resources	215 466	175 412	126 706	108 333
PhD operation (1k€/person after)	7 000	8 000	5 000	4 000
Research projects operations	62 000	62 000	62 000	62 000
Research platforms consolidation (COLIBRI, SPACE, IR, and ELIXIR)				
COST: Research	69 000	70 000	67 000	66 000
IPhU Operations	1 743	1 743	1 743	1 743
Innovation (incentive money)	2 000	2 000	2 000	2 000
Outreach				
Education platforms consolidation (IRIS@OHP,ePERON @OHP&OPM)	4 500	4 500	4 500	4 500
COST: Innovation, Outreach and operations	8 243	8 243	8 243	8 243
Incoming grants S1-2022	20 000			
Incoming grants S2-2022	28 000			
Incoming grants S1-2023		16 000		
Incoming grants M1 Full (1/yr)	4 000	12 000	16 000	16 000
Incoming grants M1 Half (2/yr)	8 000	16 000	16 000	16 000
Incoming grants M2 Full (1/yr)	4 000	8 000	8 000	8 000
Incoming grants M2 Half (2/yr)	8 000	8 000	8 000	8 000
Outgoing M1 (1/yr)	2 500	2 500	2 500	2 500
Outgoing M2 (1/yr)	4 500	4 500	4 500	4 500
Internships M1 (3/yr)	4 950	4 950	4 950	4 950
Internships M2 (3/yr)	6 600	6 600	6 600	6 600
Training @OHP	7 000	7 000	7 000	7 000
Cours doctoraux (105h à 45€/h)	4 728	4 728	4 728	4 728
COST: Graduate School	102 278	90 278	78 278	78 278
Total sans MS	179 521	168 521	153 521	152 521
Grand Total = 1 280 000 €	394 987	343 933	280 227	260 854

1 PhD/yr

1 k€/yr/PhD
62 k€/yr

Master: 83.3k€/yr
PhD courses: 4.7
PhD salaries: 143
PhD env.: 6

Research: 62

Innov: 8
(or 21 including IGR
Radon/IR in 2022)

TIGER Experimentation phase impact on IPhU 2022-2025 Budget

- **Allocated budget to our Master selected in the EoI TIGER 2021-2022 experimentation Call**
 - *Le parcours suivants a été lauréat de l'appel à manifestation d'intérêt TIGER lancé en juin 2021, il est associé à un autre institut.*
 - *L'institut IPhU devra s'entendre avec cet autre institut sur la gestion de ces budgets et en faire état dans la troisième partie de ce document.*

Mention de master	Parcours	Composante(s)	Budget total	Dispositif "stages"	Dispositif "mobilités"	Dispositif "colloques"	Dispositif "événements"	Dispositif "extérieurs"	Institut(s) associé(s) ...
Physique	Physique (acronyme FunPhys)	Faculté Des Sciences (FDS)	12 800 €	4 800 €	8 000 €	0 €	0 €	0 €	IPhU+ISFIN
		Somme totale à répartir	12 800 €	4 800 €	8 000 €	0 €	0 €	0 €	

Shared between IPhU and ISFIN institutes => for IPhU: 2400€ (~ 1 internship M2) et 4000€ (outgoing grant)

- **17/11/2021: Our Master is eligible for a few incoming grants for M1 and/or M2 students**
 - *Un montant de 80 000 euros vous sera donc octroyé pour 8 bourses de mobilité entrante (de 10 000 euros chacune), à répartir sur les trois prochaines années universitaires, et entre IPhU et ISFIN.*
 - *Exemple d'allocation des ressources :*
 - *Rentrée 2022 : 2 bourses de M1*
 - *Rentrée 2023 : 2 bourses de M1 + 2 bourses de M2 (M1 2022 terminant leur master)*
 - *Rentrée 2024 : 2 bourses de M2 (M1 2023 terminant leur master)*
 - **=> for IPhU 1 M1 full-grant in 2022 and 1 M1 full-grant in 2023 (40k€ over 3 years)**

2022 - 3rd CALL FOR PROPOSALS

Initial Budget: ~62 k€ and 1 PhD

Institute Council arbitration meeting took place in Feb

PI name	Title	Leading Labs	Funding	PhD	Visitors	Already Granted	Extra Grant if IPhU additional budget	Total budget finally granted
coadou@cppm.in2p3.fr	School of Statistics, SOS2022	CPPM, CPT, LAM	3 000			1 000	2 000	3 000
stephane.basa@lam.fr	Operation of the COLIBRI robotic telescope	LAM, CPPM	10 500	1 PhD (CNES co-fund)		9 500		9 500
pralavor@cppm.in2p3.fr	Direct search for WIMP dark matter	CPPM, CPT, LAM; LUPM/IFAC	8 000		3-week visitor (~2,100Eu)	9 100	1 000	10 100
stephane.arnouts@lam.fr, olivier.ilbert@lam.fr	Pix2LSST: from Pixel to Large Scale Structure with Vera Rubin Telescope	LAM, CPPM	10 500			7 000		7 000
sylvain.delatorre@lam.fr	Cosmology with Large Scale Surveys (CLASS)	LAM, CPPM, CPT	19 800	1 PhD (ANR co-fund)		16 300	1 000	17 300
denis.burgarella@lam.fr	International Research Network on Extragalactic Astrophysics and Cosmology (NECO)	LAM, CPPM	10 000			0	3 000	3 000
carlo.schimd@lam.fr	Radio@OHP, Radioastronomy at the Observatoire de Haute-Provence: a new window on the Universe	LAM, CPPM, OHP	18 390					
lorenzo@in2p3.fr	BSM Physics at the Terascale	CPPM, CPT; L2C, LUPM; IFIN-HH (Bucharest Univ. & CIVIS)	6 500		Visitor (A. Dumitriu) several 1-month stays for a total of 10,000Eu	13 000	2 000	15 000
escoffier@cppm.in2p3.fr	International School - The science of the next generation of large cosmological surveys	CPPM, LAM	5 000			0	3 000	3 000
eric.kajfasz@univ-amu.fr	Summer School on Gravitational Waves	CPPM, CPT, LAM; OCA/ARTEMIS, L2IT, IRAP	5 000			4 000	1 000	5 000
vincent.lebrun@lam.fr	From galaxies to cosmology with deep spectroscopic surveys - A tribute to Olivier Le Fevre	LAM, CPPM, CPT, LAM	5 000			4 000	1 000	5 000
perez@cpt.univ-mrs.fr	John Bell Institute workshop "Black Hole Information Puzzle"	QFT & AG	5 000			0	2 000	2 000
TOTAL		118 790	106 690	3 PhD	12 100	63 900	16 000	79 900
						AVAILABLE	62 000	79 900
						Previously		Now

Crucial to be able to consolidate co-funds managed separately by AMU and CNRS
Crucial to reinject in IPhU the 2020-2021 budget part not spent
AMIDEX arbitration (March 2022): reallocation of 220k€ out of the 270 k€ requested

Budget Strategy after Reallocation

for 2022-2025

Total: 1 502 062 € = 4*320k€ + 220k€

~ 375 k€/yr

2 PhD co-funded in 2022

Graduate School
Master: 83.3k€/yr
PhD courses: 4.7k€/yr

PhD salaries:
164k€/yr (2PhD/yr)
(or 177 including
the 2 AIDOC@AMU
recruited in 2020)

PhD environ.: 8k€/yr

Research: 80k€/yr

Innovation: 9k€/yr
(or 22 including IGR
Radon/IR in 2022)

Institut de Physique de l'Univers (IPHU)	2022	2023	2024	2025
PhD 1	12	9		
PhD 2	12	9		
PhD 3	12	12	9	
PhD 4	12	12	9	
PhD 5	1,5	6	6	4,5
PhD 6	1,5	6	6	4,5
PhD 7				
PhD 8		3	12	12
PhD 9		3	12	12
PhD 10				
PhD 11			3	12
PhD 12			3	12
PhD 13				
PhD 14				3
PhD 15				3
PhD 16				
# Nombre PhDs	8	10	8	8
# mths2020	24	18		
# mths2021	24	24	18	
# mths2022	3	12	12	9
# mths2023		6	24	24
# mths2024			6	24
# mths2025				6
cost	133 506	161 373	171 725	191 321
PhD IA-ANR 1 (co-financement à 50%)	12	9		
PhD IA-ANR 2 (co-financement à 50%)	12	9		
# mths	24	18	0	0
cost	30 600	22 950	0	0
cost RH PhDs	164 106	184 323	171 725	191 321
IGR (innovation IR/Radon)	12	0	0	0
# mths	12	0	0	0
cost	51 360	0	0	0
cost RH Other	51 360	0	0	0
COST: Human resources	215 466	184 323	171 725	191 321
PhD operation (2k€/person per yr until 2021 and 1k€/person after)	8 000	10 000	8 000	8 000
Research projects operations	79 900	80 000	80 000	80 000
Research platforms consolidation (COLIBRI, SPACE, IR, and ELIXIR)				
COST: Research	87 900	90 000	88 000	88 000
IPHU Operations	1 554	1 554	1 554	1 554
Innovation (incentive money)	3 000	3 000	3 000	3 000
Education platforms consolidation (IRIS@OHP, ePERON, @OHP&OPM)	4 500	4 500	4 500	4 500
COST: Innovation, Outreach and operations	9 054	9 054	9 054	9 054
Incoming grants S1-2022	20 000			
Incoming grants S2-2022	28 000			
Incoming grants S1-2023		16 000		
Incoming grants M1 Full (1/yr)	4 000	12 000	16 000	16 000
Incoming grants M1 Half (2/yr)	8 000	16 000	16 000	16 000
Incoming grants M2 Full (1/yr)	4 000	8 000	8 000	8 000
Incoming grants M2 Half (2/yr)	8 000	8 000	8 000	8 000
Outgoing M1 (1/yr)	2 500	2 500	2 500	2 500
Outgoing M2 (1/yr)	4 500	4 500	4 500	4 500
Internships M1 (3/yr)	4 950	4 950	4 950	4 950
Internships M2 (3/yr)	6 600	6 600	6 600	6 600
Training @OHP	7 000	7 000	7 000	7 000
Cours doctoraux (105h à 45€/h)	4 728	4 728	4 728	4 728
COST: Graduate School	102 278	90 278	78 278	78 278
Total sans MS	199 232	189 332	175 332	175 332
Grand Total : 1 502 062 € = 4*320k€ + 220k€	414 698	373 655	347 057	366 653

Réalisations & Perspectives (2)

○ Graduate School

- **Une école d'été sur les Ondes Gravitationnelles à Luminy**
(Niveau Master-Doctorant; amphis Hexagone et CPPM) ; 4-8 Juillet 2022
- « **Semaine R&D** », en cours de mise en place avec :
industriels de nos domaines – étudiants et doctorants de la GS IPhU + FunPhys –
enseignants-chercheurs, chercheurs, ingénieurs, incluant: présentation des industriels avec
possibilités de stages/thèses, speed-dating, hackathon,...
- **Partenariats internationaux Recherche et Formation**
 - Shanghai Jiao Tong (上海交通大学) et T.D. Lee Institute – déjà un accord de coopération
AMU-SJTU signé en 2019, mis en hibernation à cause du Covid...
 - CIVIS à développer
- En 2022, **recrutement de 2 doctorants sur projets sélectionnés dans l'AAP
interne IPhU** (co-financés CNES et ANR)
- **Cours du Programme Doctoral IPhU avec l'ED352**
 - ✓ 12 cours de 12 à 16h proposés, dont 5 pris en charge par l'ED352

Cours Doctoraux 2022 du Programme Physique de l'Univers

	Titre	Financement	Intervenant(s)	Durée (h)	Répartition (h)
ASTROPHYS. HAUTE ENERGIE					
	Advanced neutrino physics	ED352	José Busto, Juergen Brunner, Damien Dornic, Mathieu Perrin-Terrin	15	4, 4, 4, 3
	Dark matter from phenomenological perspectives	IPhU	Julien Lvalle (LUPM - Montpellier)	15	
GALAXIES ET COSMOLOGIE					
	Observational cosmology	ED352	Denis Burgarella, Veronique Buat, Olivier Ilbert, Eric Jullo	15	
	Bridging cosmology and galaxy formation	ED352	Carlo Schmid, Katarina Kraljic, Simona Gallerani (Scuola Normale Superiore, Pisa)	16	
PHYSIQUE DES PARTICULES					
	Standard Model	IPhU	Aoife Bharucha	15	
	Introduction to theories beyond the Standard Model of particle physics	IPhU	Michele Frigerio (L2C - Montpellier)	15	
	Introduction to Quantum Chromodynamics	IPhU	Antoine Gérardin	12	
TRANSVERSE - THEORIE					
	Field theoretical aspects of general relativity	ED352	Simone Speziale	15	
	Renormalisation and Effective Theories	IPhU	Thomas Krajewski	12	
TRANSVERSE - EXPERIMENTAL					
	The Large Research Astrophysics and Particle Physics Instruments of the coming decades	IPhU	Jean-Gabriel Cuby, William Gillard	15	
	Advanced statistical methods for HEP	ED352	Yann Coadou, Lorenzo Feligioni	15	
	Introduction to Large Surveys, Big Data, and Generous Statistics	IPhU	Matthew Pieri	15	

Réalisations et Perspectives (3)

- En 2022, soutien aux projets de la communauté IPhU (AAP interne IPhU):
 - 6 projets scientifiques collaboratifs
 - 3 Ecoles d'été, dont une école sur les Ondes Gravitationnelles à Luminy
 - 2 conférences internationales
- AAP 2 Transfer –
développement système de détection basé sur un spectromètre germanium (Mirion Technologies) de mesure radioactivité sur la Lune (SPARTAN – Space) et plus si affinités... tué dans l'oeuf :-)
- AAP AMIDEX Interdisciplinarité : 3 projets proposés (postdocs)
- AAP CPJ : 1 projet remonté au nom de l'institut – non sélectionné par le MESRI
- Chaire AMIDEX : candidature spontanée sur Ondes Gravitationnelles – pas sélectionnée
- Autres AAP (Région, CNRS, ANR, CIVIS3i)
- AAP TIGER : Transformation de FunPhys
- AAP TRIPS : MULTIVERSE

Description of the Call:

<https://www.univ-amu.fr/fr/public/lancement-de-lappel-projets-interdisciplinarite-2021>

Calendar:

- **Dec 2021 - January 7, 2022** - Consultation of the Institute community by submitting a 2-page LoI (letter of intent) from teams interested in applying
- **Jan 10, 2022 - Jan 21, 2022** - Processing of the Lols by the Institute Council, recoupling with the project leaders and pre-selection of a maximum of 3 projects
- **January 24, 2022 - February 18, 2022** - Preparation of the project files selected by the project leaders, in interaction with the Institute
 - first draft version on **Feb 7th** for feedback w/ AMIDEX on interdisciplinary aspects
 - final version on **Feb 18th**
- **February 21, 2022 - February 25, 2022** - Processing of the applications by the Institute Council for validation and possible iteration with the applicants before submission to A*Midex
- **February 28, 2022 noon: deadline for submission of applications to A*Midex**
- **July 2022: Announcement of selected projects**

PI	Title	Labs	Status	Requested
Aoife Bharucha	Low@LHC - Low mass resonances at the LHC	CPT, CPPM; L2C, LUPM	LoI submitted to IPhU Preselected by Inst. Council Application form Iter1 submitted	2-yr Postdoc + TBD
Damien Dornic	NEXCOS - NEutrinos and X-ray follow-up for Cosmic-ray Source studies	CPPM, LAM	LoI submitted to IPhU Preselected by Inst. Council Application form Iter1 submitted	2-yr Postdoc + TBD
Eric Jullo	DC2DM - Direct and Cosmological characterization of dark matter	LAM, CPPM	LoI submitted to IPhU Preselected by Inst. Council Application form Iter1 submitted	2-yr Postdoc + TBD
Denis Burgarella	IPEACE - Interdisciplinary Project for Extragalactic Astrophysics and Cosmological Enormous Spectroscopic Surveys	LAM, CPPM, CPT(?); I2M	LoI submitted to IPhU Not preselected by Inst. Council	

Non exhaustive list of recent applications...

- 2 projects co-funded by Région SUD - selected
 - ELIXIR - robotic telescope @OHP for follow-up for multi-messenger astronomy and for NEOs (near Earth objects)
 - radio@OHP
- Submitted to the French National Research Agency (ANR)
 - 1 project in Particle Physics on BSM Theory+Experiment – not selected
- 2 projects MITI (CNRS) 2022 « Rare Events » - selected

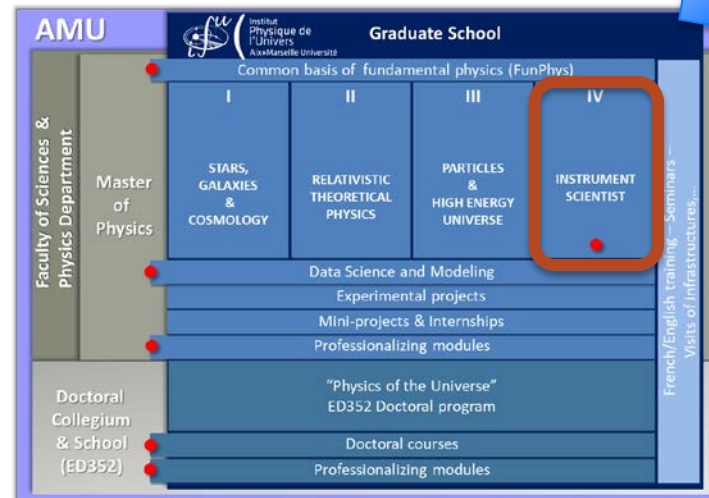
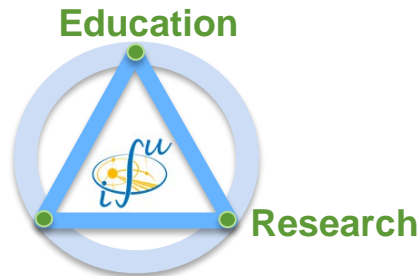
DE OLIVEIRA ISHIDA	Finding the first generation of stars with LSST	Laboratoire de Physique de Clermont	UMR6533	Aubièrre Cedex	IN2P3, INSU, IN2P3, Russian university, Australian university
HUBAUT	Direct search for WIMP dark matter	Centre de Physique des Particules de Marseille CPPM	UMR7346	Marseille	IN2P3, INSU

- 1 postdoc project CIVIS3i on HE Astrophysics in the framework of the « The CIVIS Alliance Programme for International, Interdisciplinary, Intersectoral Research and Training for Experienced Researchers » – still waiting for results
- 1 project « Chaire AMIDEX » on Gravitational Waves – not selected
- 1 ERC Starting 2021 – Dorothea Vom Bruch sur « AcceLerated PreCision **Tests of Lepton UniversAlity** » ← thématique soutenue par IPhU

We will continue and reinforce this dynamics
IPhU working groups can be a forum and place to discuss this

Transformation of the Master Programme, involves:

UFR – Physics Department
Master « Mention Physique » and « Parcours FunPhys »
IPhU and ISFIN (essentially)



● (partly) shared with other curricula in Faculty of Sciences and/or ED352

Creation of an "Instrument Scientist" flavor
Integration of the TRIPS platform MULTIVERSE

Socio-economic Sector

International

Research

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): Wednesday, April 27, 2022**
- Announcement of selected projects: Friday, June 17, 2022
- Implementation meeting of selected projects: July 2022

TRIPS (Teaching and Research Interdisciplinary Platform)

For ~ 10 projects for a total of 2.6 M€- 18 institutes

Types of projects supported:

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 Call for Expression of Interest: Fri, Jan 28, 2022

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

TRIPS Call for projects (stage 2): open Jul 2022 - Oct 2022

Evaluations: Oct 2022 - Dec 2022

Implementation of selected projects: Jan 2023

Goal: experiment a new platform based on multi-messenger observational instruments used to train students in a more attractive and effective approach by promoting research, research methodology and interdisciplinarity as driving forces of the training process.

MULTIVERSE dedicated to immersing students in a training environment based on projects using the same approach used in professional research:

- identify a question of interest;
- identify what observations/experiments to make and which tool(s)/instruments(s) to use;
- write a project proposal to request for tool/instrument time allocation and possibly budget request for tool/instrument upgrades;
- possibly design, build and install the upgrades;
- perform observations, acquire and manage the corresponding data in the allotted time;
- process and analyze the data;
- confront data with simulation/model/theory;
- publish an internal note/report and possibly an article.

=> **allow students to develop skills and competence that are sought after, both in the academic and socio-economic sectors**, and give them solid scientific foundations to identify a question or problem, implement a process to solve it, and communicate on the results, in an autonomous way.

Target: Master and PhD students, but platform versatile enough to be efficient at introducing and transferring solid basis of the scientific method to **Bachelor and even secondary school students**.

MULTIVERSE

AMU/AMIDEX

Fac. of Sciences

OSU Pytheas

Doctoral Schools

Phys. Dept.

IPhU

Instruments@OHP

T193

IRiS

ePERON

Radio

Digital
campus

Remote control
room (LAM)

IRiS
Radio

Remote Control Center
(Luminy TPR2-LAB.3.12)

IRiS
Radio
ePERON

Neutrinos

Gamma rays

Gravit. waves

Particles

**Need to be anchored to the
Master Programme
But also accessible to PhD
and Bachelor students**

**Possible connections with
other institutes**

Origins (for what concerns
astrobiology, exo-planets,...),
OCEANS (on Deep sea
environment) and **AMI** (on
signal processing, and
Machine and Deep learning,...)
 They have been/will be
contacted for the preparation of
the Phase 2 of the TRIPS Call.

Other instruments

LSPM – KM3NeT
Neutrinos
& Deep sea
environment
Open data

SVOM/Colibri
CTA/HESS
Open data

LISA &
LIGO/Virgo
Open data

CERN - LHCC
Open data

In a 2nd step