Johann Collot
University Grenoble-Alpes, CNRS/IN2P3

Higher-education :

- Today's status
- Subatomic lab plateform
- GraSPA : Graduate School in Particle and Astroparticle physics
- ESIPAP : European School of Instrumentation in Particle and Astroparticle Physics

Technology transfert, Spin-offs :

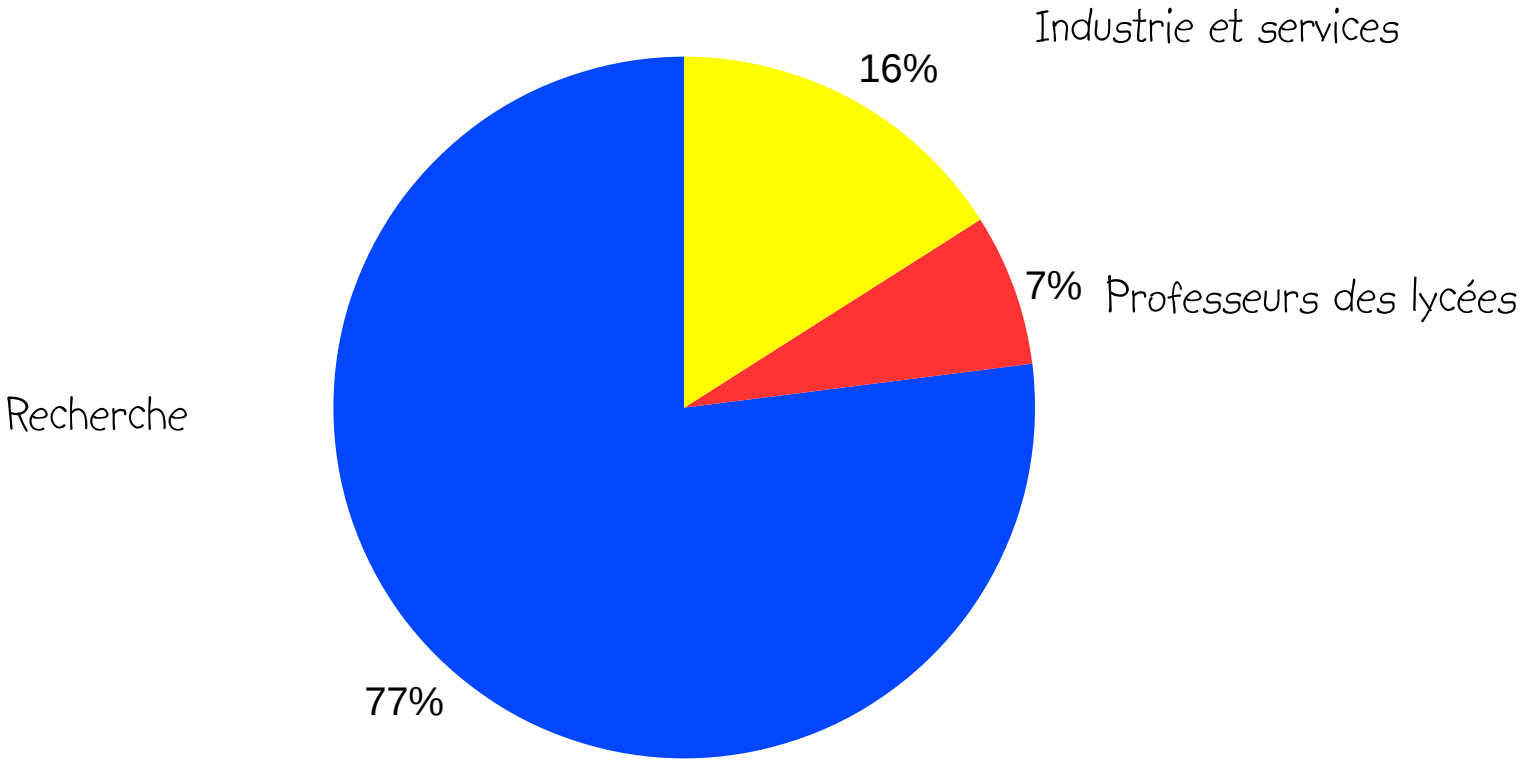
- Development of high-performance seismic sensor
- Development of a directional portable neutron detector

Situation actuelle

- ~50 enseignants-chercheurs
- Université de Grenoble : UJF, UdS et Grenoble INP
- 7 masters et 2 écoles d'ingénieurs
- ~100 diplômés par an dans nos masters & écoles d'ingénieurs de physique subatomique
- ~500 étudiants par an, au niveau master, passent sur notre plateforme de TP de physique subatomique
- ~50 étudiants en thèse dans nos laboratoires

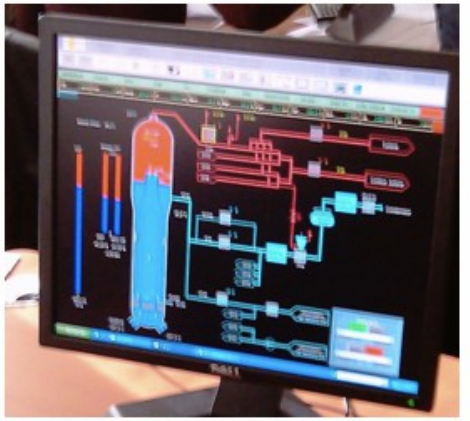
Devenir de nos doctorants

Sur nos 150 derniers doctorants



Plateforme expérimentale de physique subatomique

- 19 dispositifs expérimentaux
  - TP conventionnels (interaction γ et α avec la matière, RC)
  - TP plus ciblés (neutronique, activation, applications médicales, ...)
- 2 salles informatiques
  - Analyse de données (8 postes)
  - Simulation SIREP
    - 10 postes – Licence SIREP CORYS-TESS
    - Approche sous-critique et divergence, recherche du seuil de chauffe nucléaire, essais physiques à puissance nulle, démarrage et couplage au réseau.
- Investissement important ~20 k€/an



Organized by :

Lucia Di Ciaccio (LAPP)
Pablo Del Amo Sanchez (LAPP)

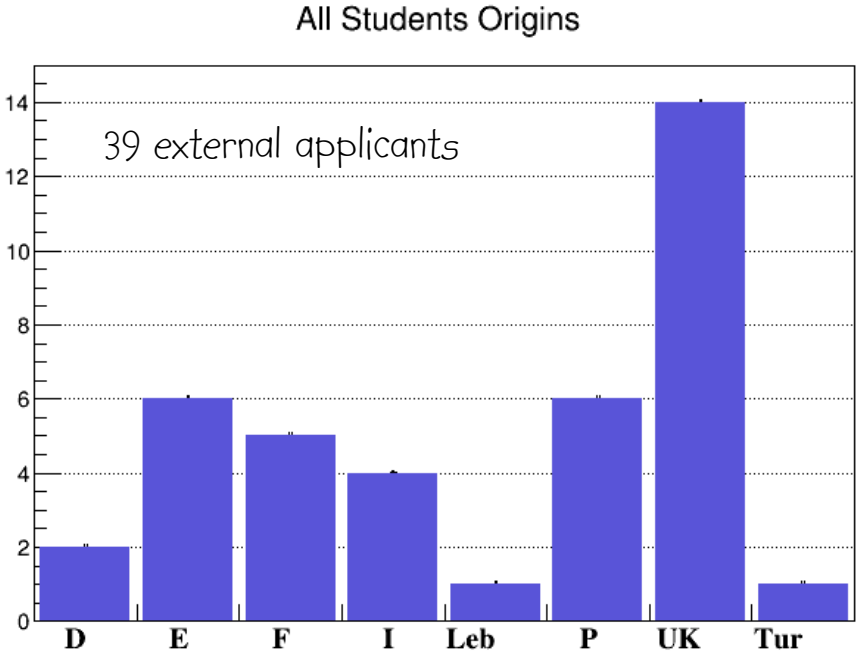
and many others....

Context and goals :

- attract bright students and try to reverse constant decrease of physics students recruitment.

- complement international topical physics schools offer for bachelor and first year master students

- benefit from IDPASC : International Doctorate Network in Particle, Astroparticle physics and Cosmology (http://www.idpasc.lip.pt)


All Students Origins
39 external applicants
14
12
10
8
6
4
2
0
D
E
F
I
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P
UK
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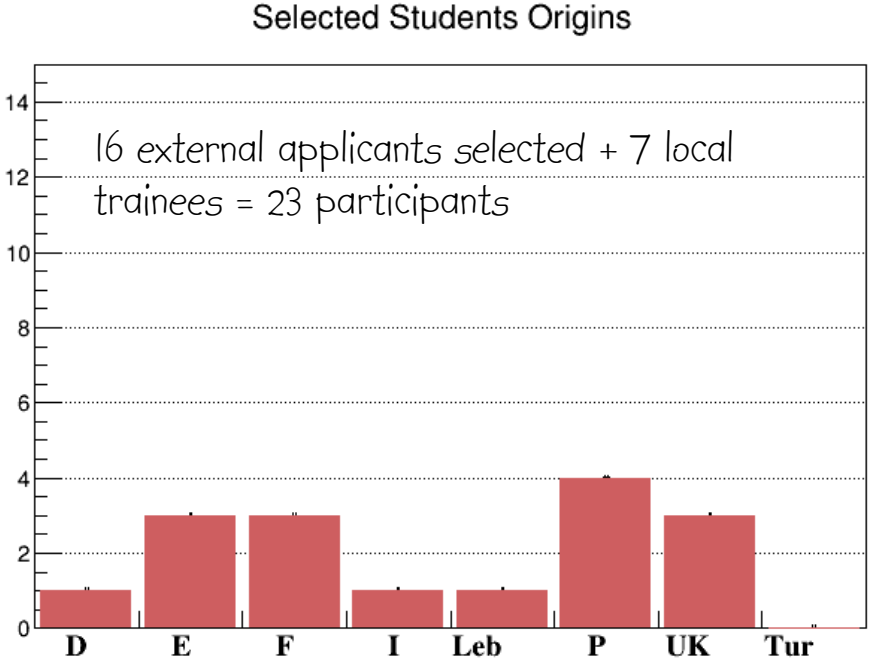
Selected Students Origins
16 external applicants selected + 7 local trainees = 23 participants
14
12
10
8
6
4
2
0
D
E
F
I
Leb
P
UK
Tur


GraSPA2013
@ Annecy-le-Vieux, France

Time	22nd July	23rd July	24th July	25th July	26th July
8h	A	Welcome speech	Astroparticles Th 2	Computing 1	Gravitational Waves 1
9h	R	8h30 Introduction to the Standard Model of Particle Physics	LHC Physics Exp 2	Computing 2	Gravitational Waves 2
10h	R	Coffee break	Coffee break	Coffee break	Coffee break
10h30	I	LHC Physics Th 1	Neutrinos Th 2	Computing 3	Heavy flavours 3
11h30	V	LHC Physics Th 2	Astroparticles Exp 1	IDPASC	Heavy flavours 4
	A				
14h	L	LHC Physics Exp 1	Heavy flavours 2	Excursion	Astroparticles Exp 2
15h		Astroparticles Th 1	Neutrinos Exp 1	Excursion	Gravitational Waves 3
16h	Reception	Coffee break	Coffee break	Excursion	Coffee break
16h30	Reception	Neutrinos Th 1	Neutrinos Exp 2	Excursion	Gravitational Waves 4
17h30	Reception	Heavy flavours 1	Questions session	Excursion	Questions session
18h	Reception			Excursion	
20h				Social dinner	

- 6 lecturers from LAPP : Pablo Del Amo Sanchez, Damir Buskulic, Lucia Di Ciaccio, Philippe Ghez, Giovanni Lamanna, Sylain Petit

- 3 lecturers from LAPTh : Eric Pilon, Pascale Serpico, Pierre Salati

- 1 LSM lecturer : Fabrice Piquemal

- 1 IDPASC lecturer : Fernando Barao

Strong contribution of ENIGMASS

GrasPA : conclusion

2013 : Successful edition, positive feedback from students
Budget : ~ 5 k€

2014 : New edition will be a bit bigger, longer and will possibly involve more international lecturers. Budget : ~10 k€

Looking forward to long term benefits : student recruitment, international visibility...

European School of Instrumentation in Particle and Astroparticle Physics

ESIPAP

- Regional observation :
  - here and there, we miss a few students per year, highly-educated in HEP and astroparticle instrumentation
  - local yearly recruitment rate (~2-4 y^{-1}) does not let the possibility to create dedicated Masters in regional universities.
- Explored solution :
  - follow the JUAS model in Archamps (created in 90's)
  - add options in regional (French and European) Masters and factorize at the European level

esi European Scientific Institute

esipap European School of Instrumentation in Particle & Astroparticle Physics

Enigmass

ESIPAP : targeted model

- Organization and management subcontracted to ESI, that already organizes JUAS
- 1 director + Steering + Organizing committees
- 2 modules : 20 January to 15 March : 8 weeks
- 15-20 students per year at European level (not the first year)
- Master students, Ph.D. students and continuing education trainees
- ~100 h / module
- Students are evaluated - 16 ECTS (2 x 8)
- Accommodation of students organized by ESI

Programme summary

- Module 1 : Physics of particle & astroparticle detectors :
  - Introduction to experimental particle physics
  - Introduction to experimental astroparticle physics and cosmology
  - Interaction of particles with matter
  - Statistical and stochastic aspects
  - Detector Simulation
  - Calorimetry
  - Tracking
  - Muon detection
  - Particle Identification
  - Imaging & Cherenkov detectors
  - Radioprotection
  - Lab sessions at CERN
  - Computing sessions at ESI
- Module 2 : Technologies and applications :
  - Detector Technologies
  - Advanced Electronics and signal processing
  - Composite materials
  - Magnets for particle detectors
  - Triggering and Data acquisition
  - Advanced computing : C++, python, GRID, data technologies
  - Ultra cold neutron production and detection
  - Medical applications
  - Project management
  - Specific aspects for space projects
  - Lab sessions at CERN
  - Computing sessions at ESI

Module 1 : 106.5 hours of lectures !

Experimental particle physics (15 h) : Marco Delmastro LAPP (ATLAS)
Experimental cosmology (9 h) : Juan Macias-Perez LPSC (Planck)
Experimental astoparticle physics (6 h) : François Montanet LPSC (Auger)
Interaction of particles with matter (6 h) : Johann Collot LPSC (ATLAS)
C++ programming (6 h) : Éric Chabert IPHC (CMS)
Reminder on probablity and statistics (3 h) : Benoît Clément LPSC (GRANIT)
MVA Analysis & boosted decision trees (6 h) : Yann Coadou CPPM (ATLAS)
Tracking (6 h) : Jérôme Baudot IPHC (CMOS & ILC)
Calorimetry (6 h) : Isabelle Wingerter LAPP (ATLAS)
Muon detection (6 h) : Joerg Wotschack CERN (ATLAS)
Radioprotection (3 h) : Helmut Vincke CERN (radioprotection group)
Imaging & Cerencov detectors (4.5 h) : François Montanet LPSC (Auger)
Detector simulation (6 h) : Alberto Ribon & Witold Pokorski CERN (G4 collab)
Particle identification (3 h) : Guillaume Unal CERN (ATLAS)
Computing sessions (12 h) : Éric Chabert & Éric Conte IPHC (CMS)
Lab sessions (9 h) : 12 people from CERN !
Exams (10 h) !

More than 30 lecturers !

https://indico.cern.ch/event/294651

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Module 1

7 students from
3 countries...

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in Particle & Astroparticle Physics

Module 2 : 102.5 h of lectures

Detector technologies (7.5 h): Jean-Marie Brom IPHC (CMS)
-Working principles, gazeous detectors, semiconductor detectors, scintillation , cerenkov and transition radiation detctors
Noble liquid detectors (3 h): Johann Collot LPSC (ATLAS)
Low temperature detectors (1.5 h) : Alain Benoît Institute Néel (PLANCK)
Electronics and signal processing (9 h) : Daniel Dzahini LPSC (ATLAS)
Project management (6 h) : Pierre Bonnal CERN (CERN porject office)
C++ programming (9 h) : Sébastien Ponce CERN
TDAQ (9 h):
-VME bus : Markus Joos CERN
-Modular Electronics : Markus Joos CERN
-TDAQ software : Enrico Pascalucci (INFN Roma)
-FPGAs : Hannes Sakulin CERN
-Triggering : Francesca Pastore (Royal Holloway London)
Data technologies (6 h) : Roberto Pace CERN
Composite materials (9 h) : Jérôme Senmartin (Compositec
Magnets for particle detectors (4.5 h) : Herman Ten Kate CERN (ATLAS)
3D/additive printing (1.5 h) : Marc Krauth IPHC
Python programming (3 h) : Jérôme Odier LPSC
Grid computing (3 h) : Catherine Biscarat LPSC
Ultra cold neutron production and detection (6 h) : Guillaume Pignol LPSC (Granit)
Medical applications (7.5 h) : Ziad El Bitar IPHC
Space projects (5 h) : Jan Droz CNES (Ariane project manager for CNES)
Lab sessions (12 h) : people from CERN
Exams (8 h)

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https://indico.cern.ch/event/301339

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Summary

- ESIPAP (project initiated by ENIGMASS) is created for 5 years at least ;
- Annual budget : 70 k€ (50% ENIGMASS and 50% from ESI, Technopole of Archamps and Haute-Savoie council) ;
- At the moment, participants are : Universities Grenoble-Alpes and Strasbourg, LPSC, LAPP, IPHC, CPPM and CERN ;
- Very positive feedback from students (9) and professors (>50) ;
- Increase student recruitment by proper/massive/alumni advertisement in spring this year ;
- Seek partnership with more European universities, labs and other topical instrumentation schools (already the case with ISOTDAQ, CSC...) ;
- Hope ESIPAP will become a standard ref. in instrumentation training ;
- www.cern.ch/esipap

High-performance seismic sensor

- Spin-off of CLIC sub-nanometric final focusing activities (~0.2 nm @ 1 Hz)
- LAPP's developping of a high-performance sensor equipped with its electronics
- Patent submitted
- Gravit project
- 1 year fixed-term engineer (renewable once) granted to this project
- Complete the design, prototyping and tests of the sensor and start the tech. transfer process.

Directional & portable neutron detector

- Counting neutrons is easy (e.g. ^{3}He counters…), but recording their emission direction is far more difficult
- Solution under investigation : 3D directional detection of the nuclear recoil after neutron elastic scattering in a small and portable micro-pattern gazeous chamber with auto-triggering capability.
- Spin-off of MIMAC project
- 1 year fixed-term engineer support (renewable once) granted to this project