CERN/Archamps instrumentation school proposal

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Key elements of the proposition

- Annual school
- **Targeted audience**: Master 2 and young PhD students
  - Deliver certificates → credits recognized by partner's university rules
- **Content**: generic school
- **Aim**: Go beyond the Master's program by preparing young students to excel in research on instrumentation during their PhD
- **Time**: winter school (January/February)
  - ➢ Try to align with some European university master's programs
- **Location**: close to/at CERN
  - Host practical sessions - visits
  - Ease the access to teachers

Proposal based on esipap...

European School of Instrumentation for Particle and Astroparticle Physics

10 editions: from 2014 to 2023

2 “courses” of 4 weeks each

- **“Course 1”**: Physics of particles and astroparticle detector
  - 59 hours of lectures ; 53 hours of tutorials & labs
- **“Course 2”**: Advanced lectures on detectors & applications
  - 46 hours of lectures ; 56 hours of tutorials & labs

Archamps, Technopole,
18 km far from CERN

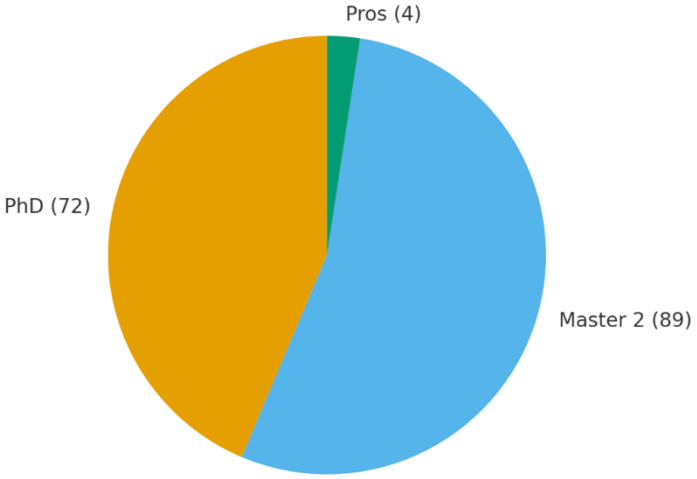
Organized and hosted at ESI

esi European Scientific Institute

head of the school: J. Collot
other schools: JUAS, etc …
location: Archamps
infrastructure: amphitheaters, computing room, relaxation rooms, kitchen, etc …

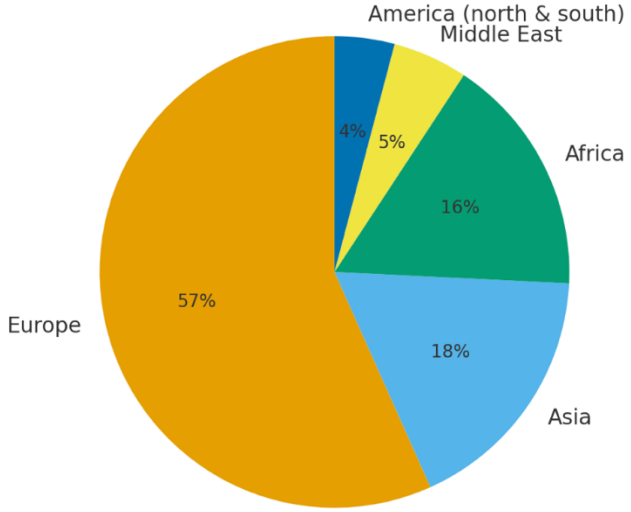
ESIPAP: attendance

Number of participants: **165 students from 41 countries**

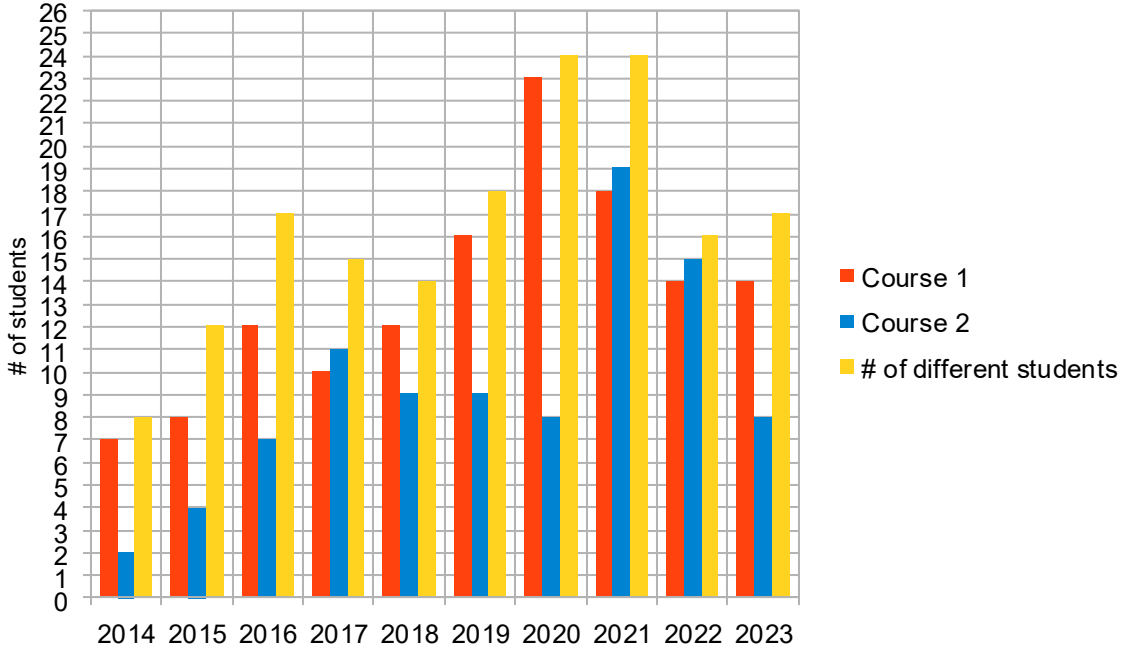


Good balance btw Master 2 & PhD students

Good diversity



Target: 20 students/course



ESIPAP: feedback

- Very positive feedback from students
  - Lectures are evaluated by students providing feedback to lecturers
- Alumini involved in tutoring/lecturing
- Inclusion of end-of-school project during course 2: good success
- Budget: about 45 k€
  - 75 % from a labex in Grenoble (ENIGMASS)
  - 25% from student fees

New proposal

- **Capitalizing on ESIPAP experience**
  - Contact with universities
  - Many teachers (56)

AN INTERNATIONAL TRAINING COLLABORATION MOBILIZING EXPERTISE AND RESOURCES FROM

- **Main changes**
  - **Shorter format:** 2 weeks
    - Closer to other schools
    - Catch a **larger audience**
  - Funding scenario

- **Organized close to or at CERN**

Content

Topics: instrumentation for HEP on colliders, neutrino physics, and dark matter searches

- Detector technologies
  - Ex: gazeous, silicon, noble liquid detectors
- Signal and data acquisition chain
  - EX: electronics, DAQ, trigger
- Particle measurement and reconstruction
  - Ex: tracking, calorimeter, PID
- Simulation
  - Ex: GEANT4 & other tools
- Simulation to construction
  - Ex: prototypes, mechanics & integration

Format and content

Proposal opened for discusion

2 weeks:

- Lectures on morning
- Tutorial/Hands-on on afternoon
- Labs at CERN
- Exam

Option to have students with the necessary level:

- One preparatory week (online/offline)
- Pre-requisite – available material/videos

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1.5 h	Detector technologies	Detector technologies	Detector technologies	Detector technologies	LABS at CERN	exam
1.5 h	Detector technologies	Detector technologies	Detector technologies	Detector technologies		exam
1.5 h	Particle measurement and reconstruction	Particle measurement and reconstruction	Particle measurement and reconstruction	Particle measurement and reconstruction		exam
	Particle measurement and reconstruction	Tutorial and/or personal working time	Tutorial and/or personal working time	Tutorial and/or personal working time		
	Particle measurement and reconstruction	Tutorial and/or personal working time	Tutorial and/or personal working time	Tutorial and/or personal working time		
		Personal working time	Personal working time	Personal working time		

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1.5 h	Signal and data acquisition chain	Signal and data acquisition chain	Signal and data acquisition chain	Signal and data acquisition chain	LABS at CERN	exam
1.5 h	Signal and data acquisition chain	Signal and data acquisition chain	Signal and data acquisition chain	Signal and data acquisition chain		exam
1.5 h	Simulation	Simulation	Simulation	Simulation		exam
	From simulation to construction	Tutorial and/or personal working time	Tutorial and/or personal working time	Tutorial and/or personal working time		
	From simulation to construction	Tutorial and/or personal working time	Tutorial and/or personal working time	Tutorial and/or personal working time		
		Personal working time	Personal working time	Personal working time		

Budget & audience

- Budget exercice done one year ago with ESI
  - Prices are significantly increased compared to the start of ESIPAP
  - **Accomodation**: ~ **€60/day/student** in campground (mobile home).
    - Could be **reduced** if organized at **CERN** and/or if **CERN hostels or the Foyer** are available.
    - Accommodation expenses could be **included in the fees for PhD students**, though this may be **more challenging for Master 2 students**.
  - **Organization cost**: about 15 k€ for ESI
    - A recurring local school requires a support – could it be CERN ?
  - **CERN is a central place** and it decrease the cost related to the participation of teachers
  - Latest evaluation: 53 k€
- Targeted audience: **40 students**
  - Limited by budget (if not directly paid through fees)
  - Limited by access to labs and hands-on

Complementarities of school

Three main kinds of school

- This proposal: Generic school to prepare to PhD in instrumentation
  - Annual school organized near CERN
  - Aimed at preparing students for PhD-level research in instrumentation
  - Instructors could be involved over several years, ensuring continuity and expertise
- Generic advanced school (e.g., EDIT)
  - Target audience: PhD students and postdoctoral researchers with prior knowledge and experience
  - Focus on advanced topics (e.g., quantum sensors, AI for detectors) or cover a broader range of applications
- Dedicated (and shorter) schools
  - Focused on specific technologies or domains