



III LASF4RI for HECAP Symposium:  
Update of the Strategic Plan

# from LA-CoNGA physics to EL-BONGÓ physics

an open-science collaboration between Latin America and Europe for advanced training in physics



José Ocariz, Université Paris Cité and LPNHE-IN2P3  
on behalf of the LA-CoNGA physics and EL-BONGÓ physics communities



Latin American alliance for  
Capacity building in Advanced physics

**LA-CoNGA physics**



Cofinanciado por el  
programa Erasmus+  
de la Unión Europea

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# The main concept : virtual research and learning networks

## Internationalization

collaborative international environment

## Accessibility



Each institution/group might not have all the resources/staff



## Modernization



open educational resources, connectivity, acquisition of digital skills, and use/development of new learning methods

Sánchez, A., and Atlas Collaboration. "The CEVALE2VE case." PoS ICHEP2016 (2016) 322

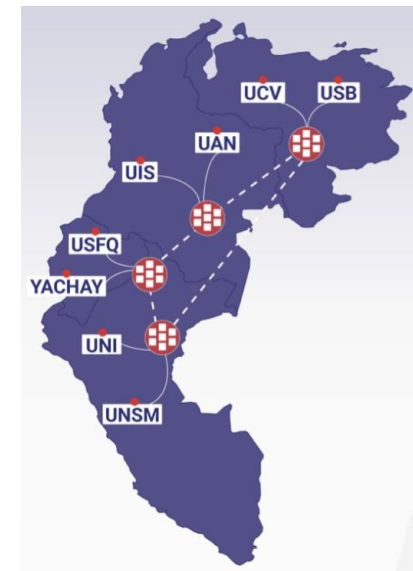
Caicedo, M., et al. "Virtual research and learning communities in Latin America: The CEVALE2VE case." Interciencia 42.11 (2017): 733-738



# LA-CoNGA physics *in a nutshell*

- LA-CoNGA physics is an **Erasmus+** project, **CBHE** category (Capacity Building in Higher Education)
  - 4-year EU funding: 900 k€, in the 2020-2023 period
- Main objectives :
  - **contribute to the modernization** of higher education in the Andean region
  - **build a network of common capacities** in advanced training for 8 Universities
    - Colombia, Ecuador, Perú, Venezuela
  - strengthen collaboration between **Latin America** and **Europe** in Higher Education
    - with support of universities and research centers in Europe and Latin America
- Proof-of-concept : setup a **Master-level** complete year in **Advanced Physics**
  - **common, cross-institutional** program
    - **inserted** in the already-existing **local Master** programs
  - modern, **interconnected** instrumentation laboratories
  - **innovative e-learning platform**, fully based on open-access contents and tools
  - problem-solving pedagogical approach, structured in mini-modules
  - **3-month internships** in research labs or industrial partners (in Europe or LA)
  - Syllabuses calibrated on the EU **Bologna process** (i.e. 60 ECTS = 1 full year)

Co-funded by the  
Erasmus+ Programme  
of the European Union





# LA-CoNGA physics a multinational consortium

## Program Partners in Europe

- Université Paris Cité (**UPCité**), France (**Coordinator**)
- Université Paul Sabatier Toulouse, France (**UPS**)
- Technische Universität Dresden (**TUD**), Germany

## Program Partners in Latin America

- Colombia : **UIS** (Bucaramanga), **UAN** (Bogotá)
- Ecuador : **Yachay Tech** (Ibarra), **USFQ** (Quito)
- Peru : **UNI**, **UNMSM** (Lima)
- Venezuela : **UCV**, **USB** (Caracas)

## Associated Partners

- international research centers:
  - **CERN** (Geneva)
  - **ICTP** (Trieste)
- international research centers: **CNRS**, **CEA** (FR) **DESY** (GE)
- industrial partners in Latin America and Europe
- other academic partners in the Americas

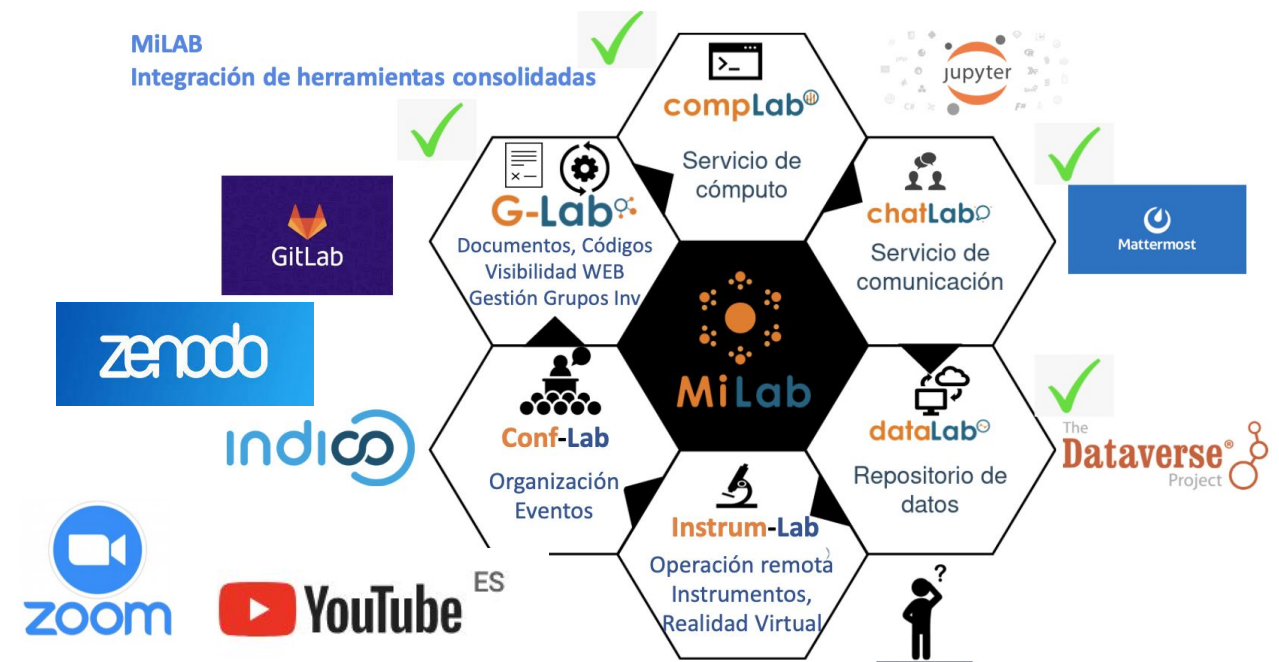
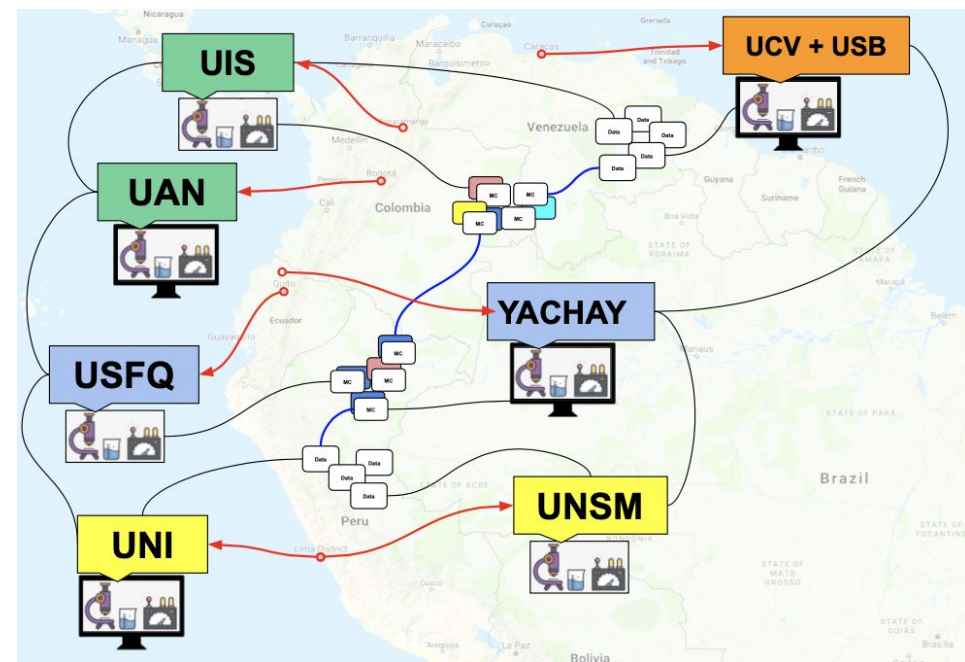
Principal investigator : J. Ocariz (UPCité), Luis A. Núñez (UIS) as co-PI





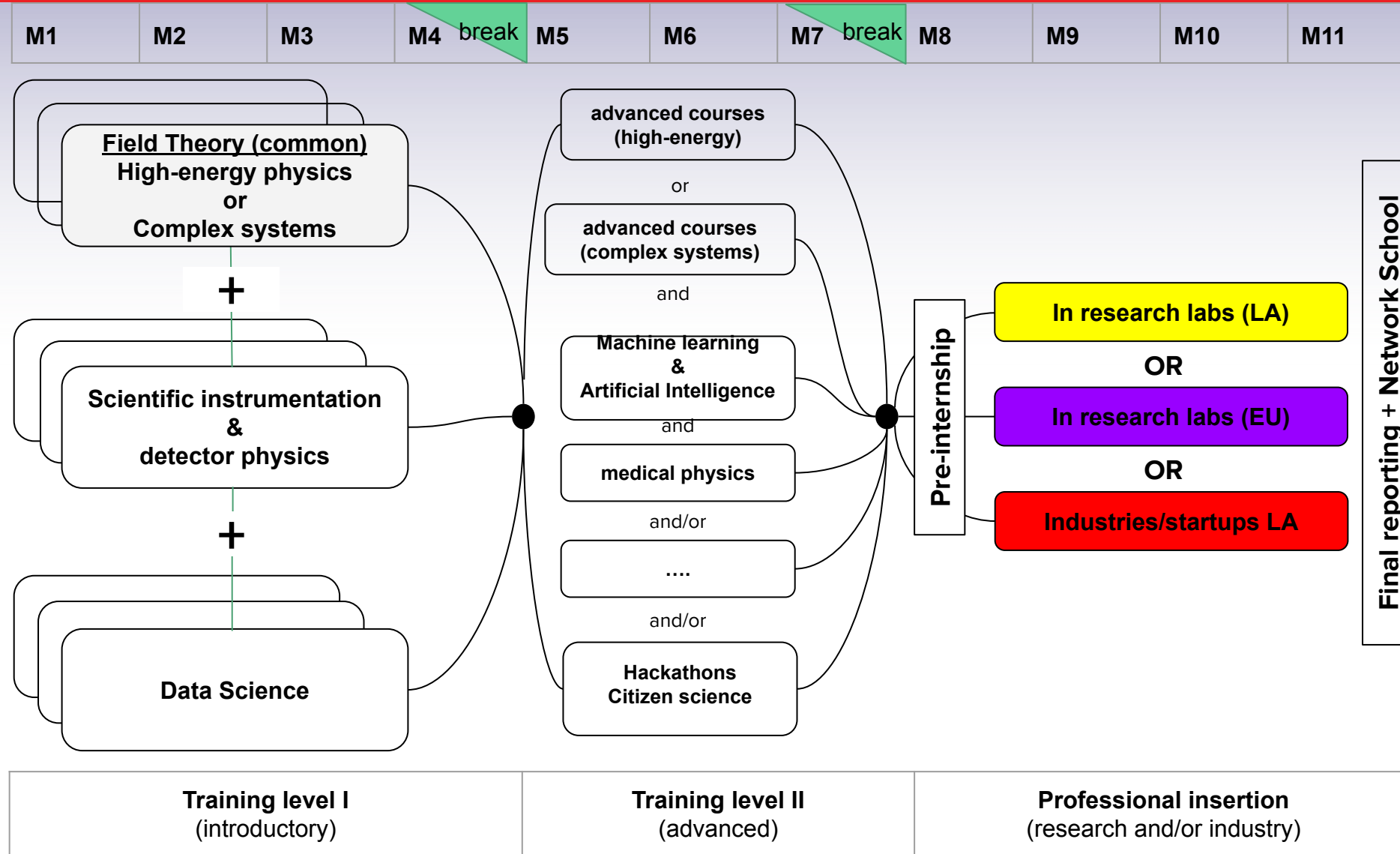
# LA-CoNGA physics : *methodology and tools*

- LA-CoNGA physics reproduces a **modern, cross-institutional, international**, working environment
- MiLAB : our **e-learning** platform, intensively based on **open-access** tools
- module-structured courses, taught in “**semi-presencial**” mode
  - partly remotely from Europe, partly from Latin America
- Academic support: individual mentorships, discussion forums, office hours, discussion sessions...
- **interconnected** instrumentation labs in **remote access**
- teaching material in **Spanish**
  - all **available online** : videos, courses, docs, notebooks...





# LA-CoNGA physics as a *matrix-structured syllabus*



<http://laconga.redclara.net/wp-content/uploads/2020/07/preguntas-frecuentes-LACoNGA.pdf>

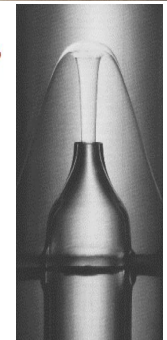
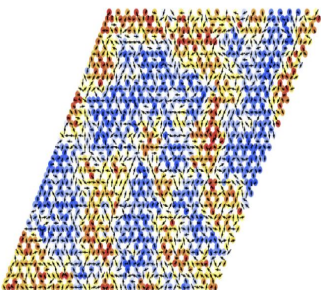
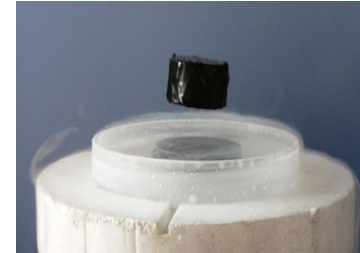
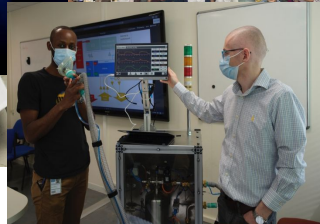
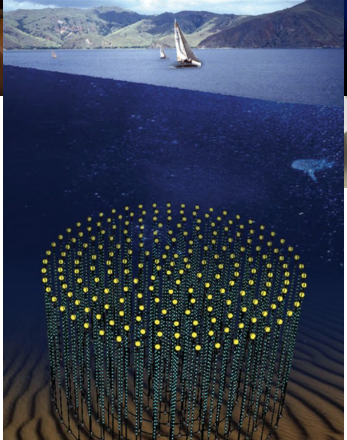
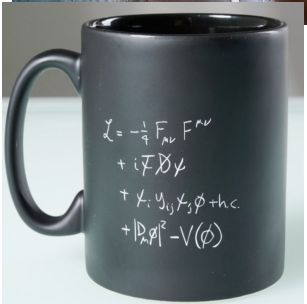
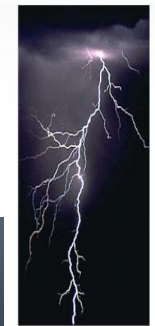
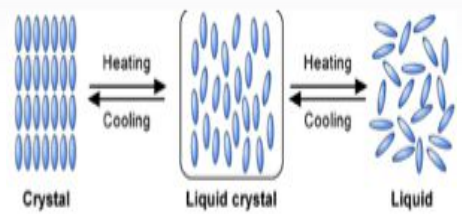


# the LA-CoNGA physics curriculum : two theory streams

A common conceptual framework : **Field Theory**

High-Energy physics

Physics of Complex Systems





# the LA-CoNGA physics curriculum : data science

## Objectives:

- Train on tools and concepts for data analysis, aiming at scientific inference
- Strong emphasis on scientific reproducibility, open science and collaborative approach
- Exercises based on open-access datasets
- First-semester finalises with a data-science project (defined by the students or chosen from a pool)
- Completed with and advanced Data Science course (2nd semester) : Machine Learning

PDF de la clase

What is open science? & Why reproducibility is important in science?

Software Projects and Reproducible Environments

**Recursos a revisar**

- Material en general
  - Video-tutorials for VirtualBox and VM → <https://videos.cern.ch/record/2715261>
  - Follow the documentation → <http://opendata.atlas.cern/release/2020/documentation/vm/vm.html> / <http://opendata.atlas.cern/release/2020/documentation/vm/>
  - Clave - password para todo → **root**
  - <http://localhost:8888/> → **ingresar a la VM**
- Esta es una solución que les permite correr todos los ejemplos mencionados en la clase 6
  - Ejemplos de ATLAS Open Data: <https://github.com/atlas-outreach-data-tools/notebooks-collection-opendata>
  - La puedan "actualizar" como quieran, y experimentar mas :)
  - En algunos días deberá ser implementado en el JupyterHub, pero hemos tenido un retraso

LA-CoNGA physics 6 ¡SUENA BIEN!

Video de la clase

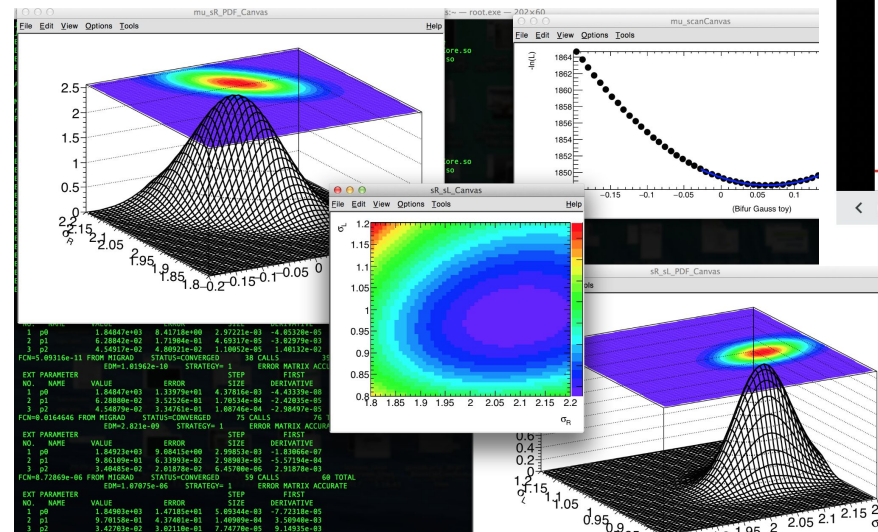
Clase 4 - Módulo de Análisis de Datos - ...

Watch later Share

Clase 4  
Arturo Sánchez Pineda  
Módulo de Análisis de Datos

Latin American alliance for Capacity building in Advanced physics Confundado por el programa Erasmus+

A screenshot of a Jupyter Notebook interface. The main content area displays a bar chart with blue bars of varying heights. The x-axis is labeled with numerical values, and the y-axis is labeled with numerical values. The interface includes a top navigation bar with icons for home, search, and other functions. A video feed in the top right corner shows a person's face.



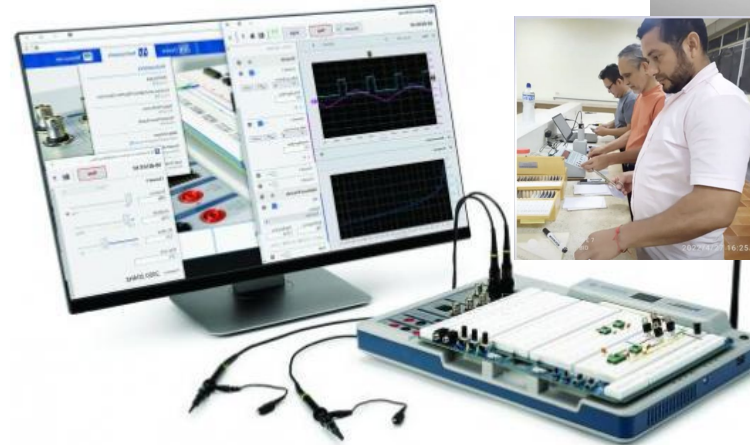
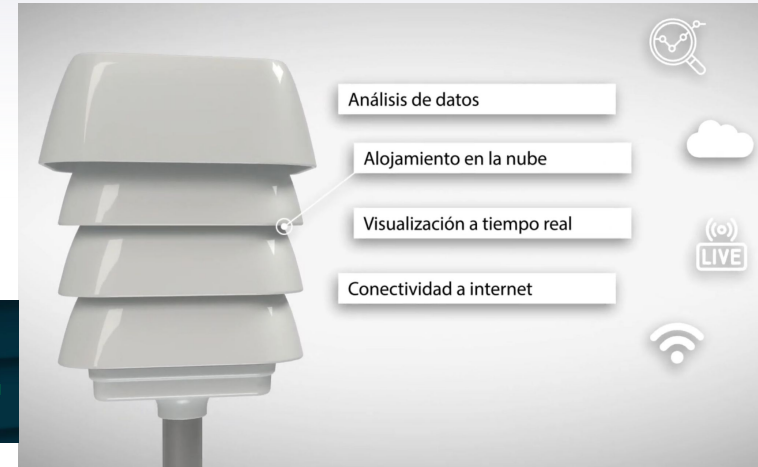




# the LA-CoNGA physics curriculum : scientific instrumentation

- Advanced teaching lab in **Nuclear Physics** :
  - **CAEN** Premium Kit and **CAEN** EasyPET
    - scintillators, SiPMs, spectrometers...
- Laboratory toolkits: **Multi-purpose, interconectable** and **remote-accessible**
  - **National Instruments** Virtual Instrumentation Suite ELVIS III
  - **Keysight** EDU Series for Ecuador
    - oscilloscopes, function generators, protoboards...
- Air-quality monitoring stations for **high-school science labs**
  - **Made in Colombia** by **MakeSens** startup
- Remote-controlled experiments on chaos (Chua circuit, double pendula...)
  - by **e-pisteme Tech**, a startup from Spain

Material deployed in all 8 Latin American partner Universities





# LA-CoNGA physics : internships in international mobility

## Objectives:

- Immersive professional experience
  - in research labs or industries
  - mostly in another LA country
  - some internships in Europe
- Results of the internship presented in the end-of-year **Network School**
- 4 cohorts so far : 2021, 2022, 2023
  - the 2024 courses are ongoing

### LA-CoNGA physics International Network School 2022

Dec 5, 2022, 2:00 AM → Dec 7, 2022, 5:30 PM America/Bogota  
 Escuela de Física (Universidad del Magdalena)  
 Jose Ocariz (Université de Paris Cité) , Reina Camacho (CERN)

**Description** LA-CoNGA physics Network School is an international event to share experiences and practices with students and instructors of the LA-CoNGA Physics project. In this event, the students will have the opportunity to discuss the results of their internships with classmates and experienced researchers from the institutions' members of the consortium

LA-CoNGA physics (Latin-American alliance for Capacity building in Advanced physics) is an ERASMUS+ CBHE project aiming to support the modernization of university infrastructure and its pedagogical offer in advanced physics in four Latin-American countries: Colombia, Ecuador, Peru and Venezuela. This project is co-funded by the Education, Audiovisual and Culture Executive Agency of the European Commission. Our teaching and research network comprises three partner universities in Europe and eight in Latin America; high-level scientific partners (CEA, CERN, CNRS, DESY, ICTP), and several and two industrial partners.



**Pasantías de investigación 1era Cohorte**

Colaboración y acceso a laboratorios internacionales

Estudios fenomenológicos del tamaño del skymion

- David Leonardo Ramos (Universidad Industrial de Santander, Colombia)
- Tatiana Lora Nieto (Universidad Industrial de Santander, Colombia)
- Tatiana Pineda Pineda (Universidad Toulouse III - Paul Sabatier, Francia)
- Institución: Université Toulouse III - Paul Sabatier

Caracterización de la señal de rayos asociados a eventos ELVES

- Jorge L. Peña (Universidad Industrial de Santander, Colombia)
- Universidad Industrial de Santander, Colombia
- Tatiana Roberto Marín (Luzmila Nacional de Física Nucleare Gazeosa ST. Ponce, URU en Chile)
- Laboratorio: Observatorio Pierre Auger

Análisis para encontrar el centro de chubascos de partículas en MATHUSLA

- Óscar Misael Aro Rojas (Universidad Nacional de Ingeniería, Perú)
- Tatiana Jhon Soto (Universidad Nacional de Ingeniería, Perú)
- Tatiana Juan Carlos Arango Villaluz (Universidad Metropolitana de San Andrés de Bogotá, México)
- Tatiana Karol Salazar Caballero (Universidad Autónoma de Chiapas, México)
- Experimento: MATHUSLA en el CERN

Grafico: interacciones entre defectos topológicos y grados de libertad electrónicos

- Nicolás Fernández (Universidad Nacional Mayor de San Marcos, Perú)
- Tatiana Tzuc Yanga (Universidad Nacional Mayor de San Marcos, Perú)
- Tatiana Pineda Pineda (Universidad Toulouse III - Paul Sabatier, Francia)
- Institución: Université Toulouse III - Paul Sabatier

Estudio de las incertidumbres sistemáticas del alineamiento global del detector AFP mediante eventos exclusivos de dos muones

- Carlos Andrés Pineda (Universidad Antonio María, Colombia)
- Tatiana Gabriela Navarro (Universidad Antonio María, Colombia)
- Tatiana María Tzuc Yanga (Czech Academy of Sciences, República Checa)
- Experimento: ATLAS en el CERN

Observación de la Modulación del Flujo de rayos cósmicos galácticos con los ciclos solares

- Jennifer Giraldo (Universidad Industrial de Santander, Colombia)
- Tatiana Lora Nieto (Universidad Industrial de Santander, Colombia)
- Tatiana Roberto Marín (Luzmila Nacional de Física Nucleare Gazeosa ST. Ponce, URU en Chile)
- Laboratorio: Observatorio Pierre Auger

**Pasantías de investigación 2da Cohorte**

16 universidades de América Latina

11 laboratorio europeo

11 empresa

Física de partículas

- Yolanda Buitrago (Universidad Nacional de Santander, Colombia)
- Universidad Nacional de Santander, Colombia
- Universidad San Francisco de Quito, Ecuador
- Miguel Claudio (Universidad Central de Venezuela, Venezuela)
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- Institución: Université Toulouse III - Paul Sabatier

Astrofísica y Cosmología

- Marta Contreras (Universidad Central de Venezuela, Venezuela)
- Laboratorio de Física Nuclear de la Universidad Pierre Marie Curie, Francia
- Miguel Claudio (Universidad Central de Venezuela, Venezuela)
- Universidad Central de Venezuela, Venezuela
- Universidad Antonio María, Colombia
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- Institución: Université Toulouse III - Paul Sabatier

Sistemas Complejos

- Diego Ojeda (Universidad Nacional Mayor de San Marcos, Perú)
- Universidad Nacional Mayor de San Marcos, Perú
- Universidad Toulouse III - Paul Sabatier, Francia
- Institución: Université Toulouse III - Paul Sabatier

Ciencia de Datos

- Diego Ojeda (Universidad Nacional Mayor de San Marcos, Perú)
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**3 LA-CoNGA physics International Network School**

11 - 15 diciembre 2023

LPNHE Université Paris Cité

Laboratoire de physique nucléaire et des hautes énergies Paris, France

Cofinanciado por el programa Erasmus+ de la Unión Europea

UAN, USFQ, UNIVERSIDAD NACIONAL DE INGENIERIA, UNENHM, UNIVERSIDAD DEL ROSARIO, Université Paris Cité, UNIVERSIDAD POLITÉCNICA DE VALENCIA, TECNISCIENTIFICOS UNIVERSIDAD DE COCINA, The New York Academy of Sciences, CERN, CLARA, cedia





# LA-CoNGA physics : *beyond lectures*

## Capacity is built beyond the zoom and lab rooms

- Bi-weekly **seminars**: by guest scientists, on topics related to HEP/CS or of general interest
- **Mentorships**: close individual interactions with students
- Scientific **outreach**: workshops about science communication or specific topics
- Transversal to other communities:
  - hackatons (co-Afina 2022 and 2023, soon 2024)
  - citizen science projects with high-schools in the region

**Mujeres que hacen Física**

Historias de mujeres académicas en América Latina y Europa: trayectoria y vida

#QueremosSerMás

11 febrero 2022 | 9h00 Col - Per - Ecu / 10h00 Ven / 15h00 CET

**Día Internacional de la Mujer y la Niña en la Ciencia**

Moderado por:  
Reina Camacho Toro (CNRS, Francia)  
Joany Manjarrés (TU-Dresden, Alemania)

Invitadas que hacen vida científica en Ecuador, Colombia, Suiza y Francia

Latin American alliance for Capacity building in Advanced physics  
LA-CoNGA physics

Cofinanciado por el programa Erasmus+ de la Unión Europea

Sigue la actividad vía **YouTube**  
LA-CoNGA Physics



Latin American alliance for Capacity building in Advanced physics  
LA-CoNGA physics

**Seminario especial**  
LA-CoNGA physics

Lunes 13 de septiembre de 2021  
14:00 (Col, Ec, Pe), 15:00 Ve, 19:00 UTC  
Transmisión en el canal de YouTube de LA-CoNGA physics

Steven Weinberg: El Modelo Estándar  
Fernando Quevedo  
Department of Applied Mathematics and Theoretical Physics (DAMTP)  
University of Cambridge

#SeminariosLACoNGA #AuLACoNGA

LA-CoNGA physics presenta **#Higgs10**

Testimonios y reflexiones:  
una conversación con América Latina

15 julio 2022 | 09:00 Co, Ec, Pe; 10:00 Ve; 14:00 UTC

Antes y después de un gran descubrimiento 2012-2022

**iVolvemos a sonar juntos!**

https://laconga.reddit.com/hackathon/

LA-CoNGA physics  
Hackathon  
Datos Abiertos en América Latina 2023

Fase 1: Llamado a retos (22 Ago al 22 Sept)

Fase 2: Inscripciones (01 sept al 01 oct)

Fase 3: Hackathon (20 al 22 octubre)

ICTP International Centre for Theoretical Physics, cedia, creative commons, CLARA

Latin American alliance for Capacity building in Advanced physics  
LA-CoNGA physics

**Seminarios LA-CoNGA physics**

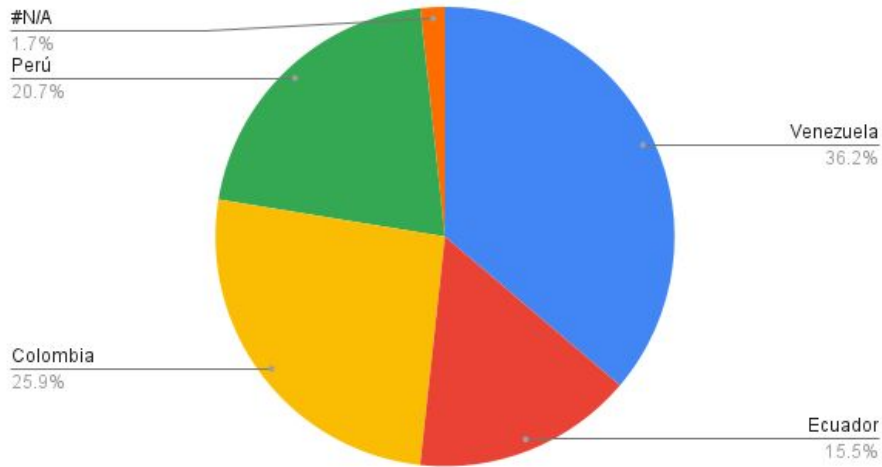
31 de mayo de 2021, 14.00 (Col, Ec, Pe), 15.00 Ve, 19.00 UTC  
Transmisión en el canal de YouTube de LA-CoNGA physics : [link](#)

Una trayectoria teórica  
Leticia Cugliandolo, Sorbonne Université, Paris, Francia

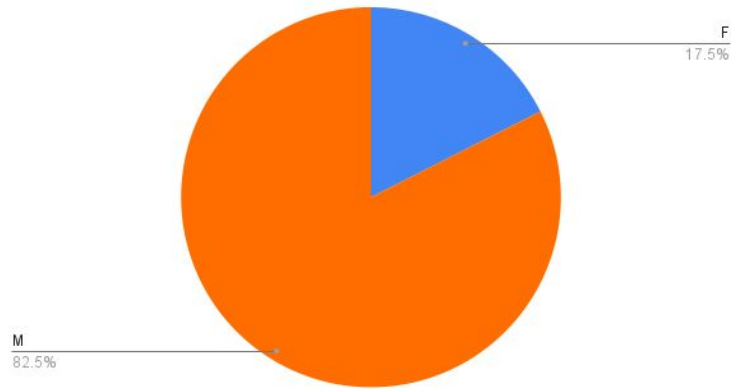


# LA-CoNGA physics : some numbers from the first cohorts

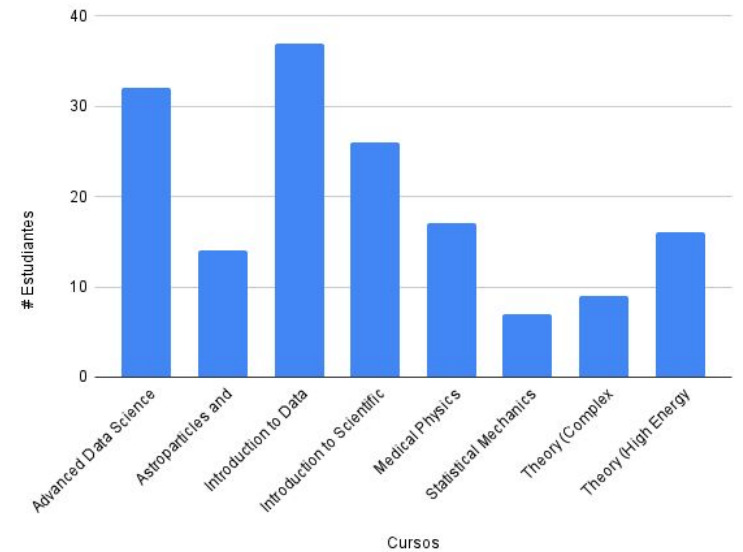
### Estudiantes por país



### Estudiantes por género



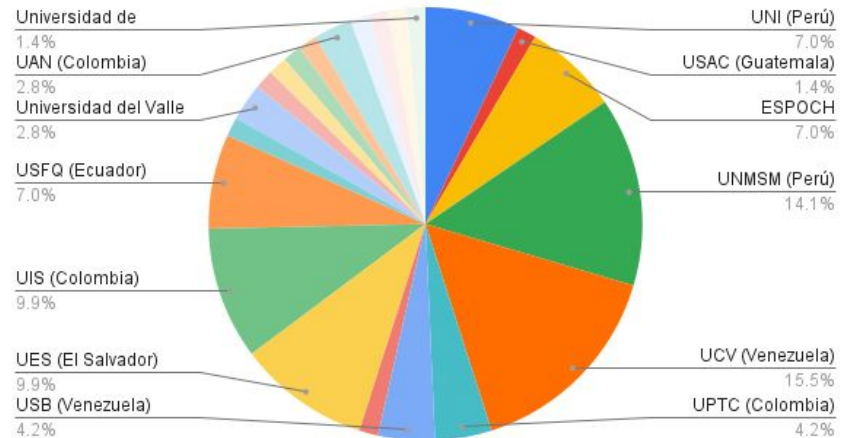
### Estudiantes por curso



... and fresh-from-the-oven :

- (preliminary) numbers from the ongoing **2024** cohort

### Count of Institución de adscripción





# LA-CoNGA physics : *some lessons learned*

- Our **balanced syllabus** (data science, instrumentation and theory) :
    - suitable training framework for various academic communities.
  - The e-methodology developed through the LA-CoNGA physics
    - can be **extended to other regions**, sharing experiences among near partners
  - Active interaction with our **scientific Diasporas**
    - through courses, coaching, and mentorships can be extended to other communities
- 
- Many of our students have **part-time jobs**, often as the unique source of **financial support**
    - a **full-commitment** to a one-year program is a **challenge** for them
  - Our community-built training program :
    - should be designed through a **more flexible** series of **self-contained short modules**
  - Our Instrumentation laboratories
    - would benefit from **augmented**/virtual reality
    - and from **improved** remote controlled equipments from different locations and connecting devices
  - Digital fabrication skills and an open-hardware approach
    - should be **incorporated early** into the training framework
    - to ensure that laboratory equipment can be **manufactured** (fully or partially) **on-site**
  - Our course certificates
    - should evolve into official **equivalence** of the courses among institutions
    - should be easy to be interpreted by potential employers

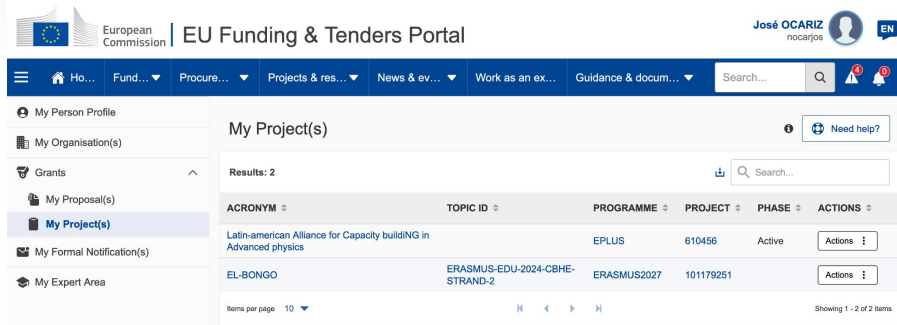


# and after LA-CoNGA physics comes EL-BONGÓ physics

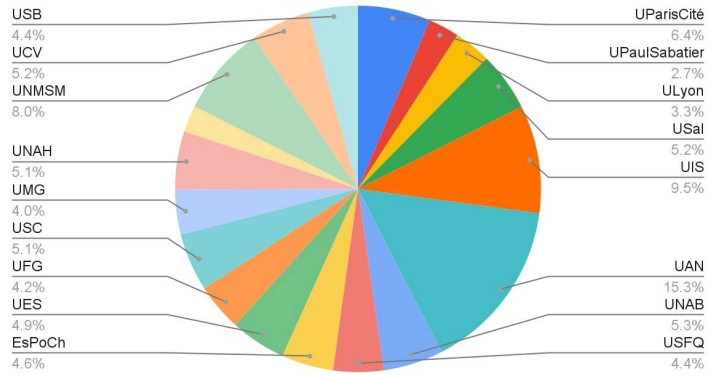
## E-Latin american digital huB for Open Growing cOmmunities in physics :

- New proposal to the ERASMUS2027 STRAND-2
  - submitted in February 2024
  - we received the approval information in July 2024 !
  - funding : 800k€ requested, ~90% granted

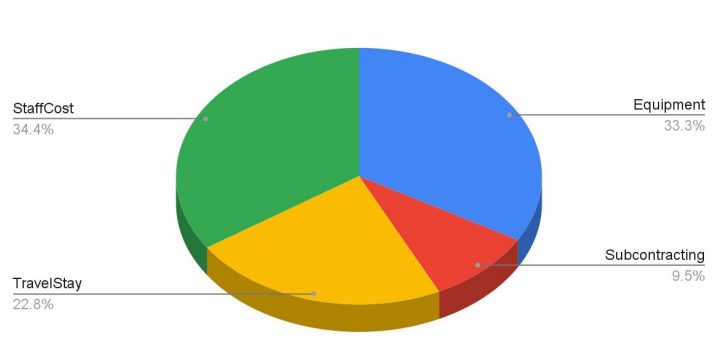
Co-funded by the Erasmus+ Programme of the European Union



EL-BONGO Budget Distribution/Institution



EL-BONGO Budget distribution



**EL BONGÓ™**  
Latin America Hub for Open Communities

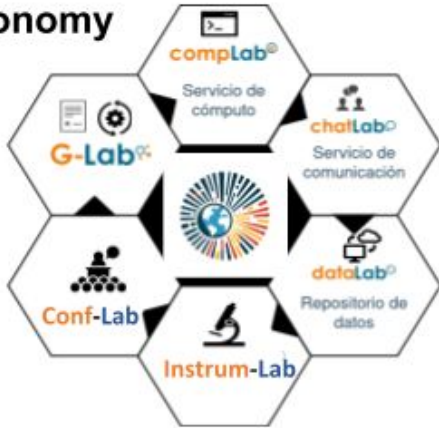


# EL-BONGÓ physics : *an expanded consortium*

- Program Partners in Europe:
  - France: Université Paris Cité; Université Paul Sabatier, Toulouse; Institut National des Sciences Appliquées, Lyon
  - Spain: Universidad de Salamanca
- Program Partners in Latin America:
  - Colombia: **Universidad Antonio Nariño (coordinator)**  
Universidad Industrial de Santander,, Universidad Autónoma de Bucaramanga
  - Ecuador: Universidad San Francisco de Quito; Escuela Superior Politécnica Chimborazo
  - **El Salvador**: Universidad Francisco Gavidia, Universidad El Salvador
  - **Honduras**: Universidad Nacional Autónoma de Honduras
  - **Guatemala**: Universidad San Carlos de Guatemala, Universidad Mariano Gálvez
  - Perú: Universidad Nacional de Ingeniería; Universidad Nacional Mayor de San Marcos
  - Venezuela: Universidad Central de Venezuela, Universidad Simón Bolívar
- Associated Partners:
  - International research centers: CERN and ICTP
  - National research centers: CIEMAT(ES), CNRS (FR), CEA (FR), DESY (GE), IPEN (PE), IVIC (VE)
  - Industrial partners in Latin America and Europe:
    - E-Pisteme Tech (Spain), Frontier X, RedCLARA, DBAccess, CEDIA, LACChain, SCALAC

Principal investigator : G Navarro (UAN), with J. Ocariz (UPCité), Luis A. Núñez (UIS) as co-PIs

## Space Weather Astronomy



- Courses
- Workshops
- Data
- Codes
- Publications
- Chats
- Visualizations

## in physics



## Seismology



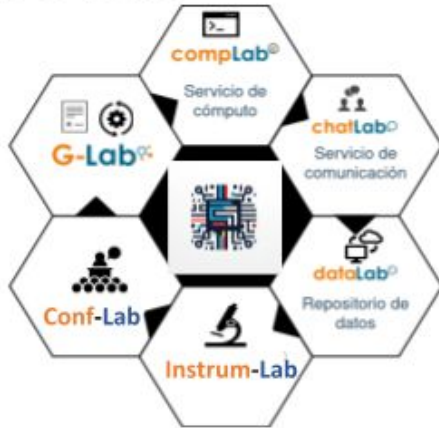
- Courses
- Workshops
- Data
- Codes
- Publications
- Chats
- Visualizations

USC(GT), UIS(CO), UCV(VE), UMG(GT), USFQ(EC), UPC(FR), UNMSM (PE)

UES(SV), UIS(CO), USB(VE), USC(GT), UNMSM(PE)

## Inter Community Open Science Hub

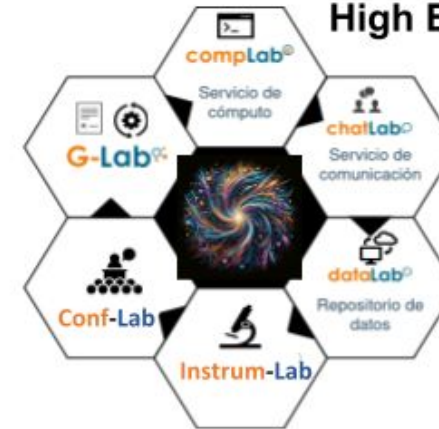
## AI-HPC Tools



- Courses
- Workshops
- Data
- Codes
- Publications
- Chats
- Visualizations

USal(ES), UIS, ULyon, UFG(SV), UNMSM(PE), UP(PA)

## High Energy Physics



- Courses
- Workshops
- Data
- Codes
- Publications
- Chats
- Visualizations

UNAH (HN), USC(GT), UPC(FR), UPS(FR), USFQ(EC), UNI(PE), UAN(CO)





Programa académico 2021  
LA-CoNGA physics

Latin American alliance for Capacity building in Advanced physics  
LA-CoNGA physics

El programa académico de LA-CoNGA physics presenta tres ejes temáticos complementarios:

**Ciencia de Datos**

Provee herramientas y conceptos para abordar el tratamiento y análisis de datos con el fin de realizar inferencias científicas reproducibles.

**Instrumentación Científica**

Orientado a proveer herramientas y conceptos para el desarrollo y uso de sistemas e interfaces en instrumentación científica.

**Teoría**

Disciplinary  
Basic  
Course

**Electiva I-A**    Hackaton    Ciencia Ciudadana    Prepasantía    Pasantías

	Basic Disciplinary modules				Optative modules			
	SA.W1->W4	SA.W5->W8	SA.W9->W12	SA.W13->W16	SB1.W1->W4	SB1.W5->W8	SB2.W1->W4	SB2.W5->W8
HighEnergy Physics	Mod1	Mod2	Mod3	Mod4	Mod5	Mod6	Mod7	Mod8
Seismology GeoHazards	Mod1	Mod2	Mod3	Mod4	Mod5	Mod6	Mod7	Mod8
Artificial Intelligence HighPerf Computing	Mod1	Mod2	Mod3	Mod4	Mod5	Mod6	Mod7	Mod8
Space Weather Astronomy	Mod1	Mod2	Mod3	Mod4	Mod5	Mod6	Mod7	Mod8

## Skills in demand in/out of academia

- Data Science
- Topic-specific Instrumentation
- Topic-specific Basic Course
- Topic-specific Advanced Course
- Hackathon & Citizen Science experiences
- Internship (12weeks)
- Community research projects

## A flexible syllabus for each Community

- each module corresponds to 32h (8h/week) ~5 ECTS
- combines Topic-specific and Elective modules
- students can select personalised training routes





The EU funding helps us with ramping up capacities in our partners :

- Internationalisation of their postgraduate programmes
  - Sharing teaching with colleagues from other institutions
  - International Master's courses taught by experts from other institutions
  - International internships for our students
- Learning-by-doing research in digital communities using the MiLAB professional digital platform
- Equipment for FABLabs at each partner
  - Developing do-it-yourself digital fabrication skills for building scientific instruments
- Building an Open Science Collaborative Hub/Science Gateway

The existing consortium commits to transferring the experiences and best practices from LA-CoNGA physics

Our new partners commit to the project with :

- An active Master's programme
- Active participation of institutional representatives, with institutional recognition for the activity of teachers
- Conditioning the physical spaces for the FABLabs
- students, STUDENTS, **STUDENTS**
  
- **2024 and 2025 : preparation work**
- **Looking forward 2026 : first year of the EL-BONGÓ physics courses !**



## III LASF4RI for HECAP Symposium: Update of the Strategic Plan



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**Obrigado !  
¡Gracias!  
Thanks!  
Merci beaucoup :-)**



lacongaphysics



Latin American alliance for  
Capacity buildiNG in Advanced physics

**LA-CoNGA physics**



Cofinanciado por el  
programa Erasmus+  
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