Mid-term LA-CoNGA physics **report (information post-evaluation)**

1. For each Partner Country, the specification about how the project addresses the national strategies and policy development in the area covered by the project.

For the four Partner Countries participating in LA-CoNGA physics, the National Strategies concerning postgraduate studies in physics were surveyed in depth at the time of setting up the LA-CoNGA physics proposal back in 2018, and our project clearly highlighted Digital Transformation and Innovation as common goals for all our Partner Countries, in full in agreement with the EU–LAC cooperation Priority 2 area[1].

We acknowledge that we faced difficulties in reassessing the most updated status of the National Strategies, mainly because it is difficult for us to promptly reach the relevant high-level interlocutors at the Ministries of Higher Education in our Partner Countries. This said, we are confident that these strategies remain relevant, as the constraints imposed by the pandemic in the last two years have clearly shown the need for a digital transformation of Higher Education.

Our project also aims at a complete harmonization of credits and courses between partners, inspired by the ECTS Bologna system. This however, is a long term programme that requires actions both at the Institutional and National levels. With this aim in sight,, a fruitful exchange of experiences has been established since 2021 between LA-CoNGA physics and IESALC-UNESCO to explore possible paths towards the accreditation and harmonization of Physics degrees in our Partner Universities.[2]

From a broader point of view, initiatives aimed at the digital transformation of higher education in LAC, in particular since 2020, have demonstrated the interest for our partner countries to further regional digital cooperation with important connectivity infrastructure. LA-CoNGA physics has been nurturing this infrastructure with high quality equipment to enrich and modernize the scientific laboratories in our Partner Institutions.

[1] NDICI-Global Europe - Americas and the Caribbean Regional MIP, 2021
https://ec.europa.eu/international-partnerships/system/files/mip-2021-c2021-9356-americas-caribbean-annex_en.pdf
[2] CILAC 2021
http://forocilac.org/wp-content/uploads/2021/11/PolicyPapers-CILAC-RRHHInvestigacion-ES-VOCT-1.pdf

Moreover, EU–LAC cooperation targets the development and investment in knowledge, innovation and human capital at the regional level. This particularly applies to LA-CoNGA physics, thanks to the EU experience on strengthening the alliances between science and the private sector, as well as transfer of technology, and by bringing together research-based ideas into start-ups and industry[3]. The above-mentioned priorities are commonly discussed and developed within the LA-CoNGA physics consortium. We also maintain regular communication with the Erasmus+ representatives in Colombia, Ecuador and Peru. We plan to establish similar contacts in Venezuela.

2. Update about the implementation of the new courses.

The LA-CoNGA physics courses are fully implemented and operative. The list of detailed courses, together with links to teaching material (documents, videos, notebooks, datasets, calendar) can be found here: https://laconga.redclara.net/courses/

The first year of courses started on January 18th 2021, and finished on December 8th 2021 during the LA-CoNGA physics Network School in Bucaramanga, Colombia. A precise calendar was established, and required only minimal changes throughout the year. The first LA-CoNGA physics cohort was composed by approximately 50 students that successfully validated at least one of the three branches offered in the Syllabus: Theory, Scientific Instrumentation, Data Science. Ten students completed the complete set of LA-CoNGA courses, performed a 3-month internship during Fall 2021, and reported their work at the LA-CoNGA physics Network School.

The second year of LA-CoNGA physics courses started on January 24th 2022. The courses and calendar follow closely the ones developed during the previous year, with only some minor adjustments. Close to 90 students are registered for this second year, which represents a significant increase compared to the size of the 2021 cohort.

3. Information about the translation of the project website in English.

The translation of the project website in English is one of the ongoing priorities of the LA-CoNGA physics consortium in 2022.
The initial emphasis was put on the Spanish version, in view of our target audiences in Latin America.

[3] EU-LAC relations, 2019
https://ec.europa.eu/international-partnerships/system/files/eu-lac-communication_en.pdf

However, given the natural ties with Europe, Erasmus+ and the collaborating institutions, the project proposes the following web visibility route in English by the year 2022:

- Phase 0 (DONE): Activation of plugins to feed the English and Spanish version of the official website
- Phase 1 (January-March 2022): translation of static information already available in the official website
- Phase 2 (April- December 2022): continuous translation of dynamic material generated in 2022. Dynamic material includes: event releases, press notes and social media publications

To this end, a new member responsible for translation activities has now joined the communication team.

4. Progress of the installation of the equipment at the partner institutions

The purchase and installation of equipment is ongoing, at a very similar pace in six of our eight Partner Institutes, yet the situation for our Venezuelan partners is more challenging. Specific details for each Partner and type of equipment are given in the following paragraphs.

The global supply chain crisis induced by the pandemic situation, has delayed the purchase and installation of the laboratory equipment for our project, initially projected to be completed during 2021. Added to this, additional delays were caused by lengthy tender procedures. The strict lockdown conditions imposed by the pandemic also posed an additional challenge, as access to University campuses was strongly limited, and often prohibited to students. Despite this unfavorable scenario, the work and enthusiasm of our partner colleagues in our Partner Institutes allowed us to address the needs of our instrumentation and computing courses during 2021. We implemented remote laboratory setups based on detectors available in Bucaramanga, Colombia.

A local technical staff configured and maintained the operation of these setups, and the students could remotely operate the devices and collect data for their training purposes.

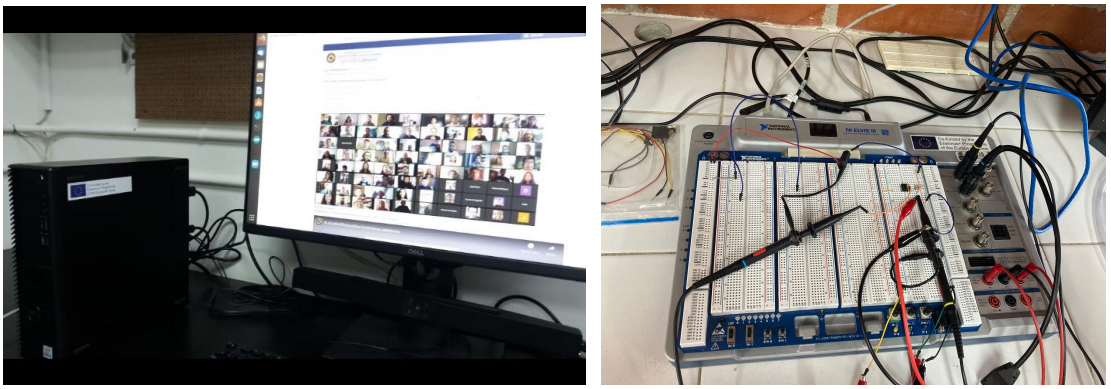

Figure 1. Dell Desktop computer stations installed in Colombian, Ecuadorian and Peruvian institutions (left). General-purpose Virtual Instrumentation Suite installed in Colombian and Peruvian institutions (right).

At this time, the installation of our LA-CoNGA physics laboratories is partially completed in six of our partner institutions:

- We installed **DELL** desktop computers in six institutions: UAN and UIS in Colombia; Yachay Tech and USFQ in Ecuador; UNI and UNMSM in Perú, as illustrated in Figure 1 (left).
- We also purchased a set of ELVIS-III kits, a general-purpose Virtual Instrumentation Suite produced by **NATIONAL INSTRUMENTS**, and these instruments are already installed in the Colombian and Peruvian Institutes, as shown in Figure 1 (right). The ELVIS-III are remote-controllable and hence accessible to all students, including those based in other countries. For Ecuador, strict Ecuadorian telecommunication regulations require special governmental authorization for this type of equipment that include wireless connectivity. We therefore selected another hardware, produced by **KEYSIGHT**, that fulfills our educational and technological needs, but does not require special permissions. These instruments have been already purchased, and are planned to be delivered to USFQ and Yachay Tech by March 2022.
- The purchase of the Nuclear Physics equipment, produced by **CAEN Spa**, has suffered from several delays due to lengthy tender procedures and worldwide shortages of some electronic components. Fortunately, their construction was completed by November 2021, and they have already arrived in Colombia, Ecuador and Perú, as showin in Figure 2 (left). Their installation and commissioning is ongoing, and is planned to be completed by end February 2022.
- We have also acquired ten meteorological stations for school citizen science projects, produced by **MakeSens**, a startup based in Colombia. As illustrated in Figure 2 (right), our stations are being constructed, will be shipped to all eight Partner Institutes by end-February 2022, and will be installed shortly thereafter.

As already mentioned, all this equipment is intended to be operated both locally and remotely and will, for this, be immersed in a Virtual Reality environment framework: the Virtual LA-CoNGA physics LAB currently in development.

Figure 2. CAEN educational kits for the interconnected laboratories, shipped and arrived to Colombia, Ecuador, Peru (left). Meteorological data analysis stations for Citizen Science Projects ready to be shipped to Colombia, Ecuador, Peru and Venezuela by February 2022 (right)

For Venezuela, the complex national situation has delayed the laboratory installations. All local providers we have contacted demand complete advanced payments of any purchase, and this requirement conflicts with the administrative rules from Université de Paris. The nuclear physics equipment intended for Venezuela is in Italy pending to be shipped, hopefully within a very short time scale.

5. Type of collaborations established with international research institutes/industrial partners and with other EU funded projects working in the same field.

The LA-CoNGA physics project is permanently broadening its exchanges with other EU funded projects. The project maintains a fruitful experience sharing with other CBHE projects coordinated in France and/or working with LAC (see fully detailed list).

Moreover, the project signed in 2020 a MoU with the GENERA–Network project (see fully detailed list), an EU-funded initiative that encourages a wider participation of women in the field of Physics. This vision is aligned with the gender-equality goals that LA-CoNGA physics supports and encourages within its community.

Finally, as part of the sustainability of the project, LA-CoNGA physics is developing the implementation of bilateral university cooperation agreements between our Programme and Partner countries. We have initiated this activity with the coordinating institution, Université de Paris. The goal is to provide bilateral HEI agreements to encourage academic and research mobilities, as well as institutional cooperation, beyond the lifetime of our current project.

An detailed list of the main LA-CoNGA physics collaborations established since 2020 (divided by categories) is the following:

International research institutes:

- The European Organization for Nuclear Research CERN[4] :
  - key partner in the ongoing searches for funding opportunities beyond 2023
  - Salvatore Mele, Head of Open Science at CERN, and responsible of the CERN-LAtin America relations office, is member of the LA-CoNGA physics External Advisory Board (EAB)
  - mentorship of four student internships in 2020 (3 within the ATLAS experiment and 1 within the MATHUSLA experiment)
  - several members of the ATLAS, CMS and LHCb experiments at CERN have contributed to various courses and given seminars
  - open data from the ATLAS and CMS experiments is used in several of our courses in 2020
- The Alan Turing Institute[5]
  - provided free access to content and material for the Data Science courses
  - a member of the Institute has contributed to the courses and seminars
- The Pierre Auger Observatory, Argentina[6] and the Istituto Nazionale di Fisica Nucleare INFN, Italy[7] :
  - mentorship of 2 student internships
  - contributions to various courses and seminars
- The Institut de Recherche des lois Fondamentales de l'Univers IRFU/CEA, France[8]:
  - contributions to the Scientific Instrumentation courses

[4] The European Organization for Nuclear Research https://home.cern/
[5] The Alan Turing Institute UK National Institute for data science and artificial intelligence, UK https://www.turing.ac.uk
[6] The Pierre Auger Observatory, Argentina https://www.auger.org
[7] Istituto Nazionale di Fisica Nucleare (INFN), Italy https://home.infn.it/it
[8] The Institut de Recherche des lois Fondamentales de l'Univers IRFU/CEA, France https://irfu.cea.fr

- Centre National de la Recherche Scientifique CNRS, France[9]
  - Reina Camacho, the LA-CoNGA physics Deputy Coordinator, is a junior CNRS staff researcher
  - various CNRS staff researchers have contributed to several courses
- The Deutsches Elektronen-Synchrotron DESY, Germany[10]:
  - members of DESY have provided content contributions for courses
- The LA-CoNGA physics seminars have hosted guest speakers from Cambridge University, Sorbonne Université, the Los Alamos National Laboratory[11], the World Meteorological Organization (UN)[12], and several other high-profile research Institutes in Latin America and Europe.

Industrial partners:

- CAEN spa, Italy (supply systems for nuclear and particle physics)[13]
  - ongoing collaboration regarding the development of the remote access/virtual platform to the CAEN kits used in LA-CoNGA physics.
- Frontier X Analytics[14]
  - participation to seminars and to the career development panel
  - contribution to the Advanced Machine Learning courses
- MAKESENS[15]
  - business relationship:
  - development and construction of meteorological stations for the LA-CoNGA physics citizen science projects
  - training and educational material for the citizen science projects
- e-pysteme[16]
  - develop remote access pedagogical experience for the Complex Systems courses
  - expected to be deployed and used in 2022

[9] Centre National de la Recherche Scientifique (CNRS), France https://www.cnrs.fr
[10] The Deutsches Elektronen-Synchrotron (DESY)# https://www.desy.de
[11] Los Alamos National Laboratory, USA - https://www.lanl.gov
[12] World Meteorological Organization (UN), Geneva https://public.wmo.int
[13] CAEN Spa, Italy https://www.caen.it
[14] Frontier X Analytics, Colombia http://frontierx.co
[15] MakeSens (environmental data analysis supplies), Colombia https://makesens.co
[16] e-pysteme (e-learning center), Spain http://www.epysteme.org/ :

EU funded projects:

- Cooperacion Latinoamericana de Redes Avanzadas (RedCLARA)[17]
  - RedCLARA is one of the official partners of the project
  - collaboration in the development of the MiLAB e-learning platform
- Gender Equality Network in Physics in the European Research Area (GENERA)[18] :
  - experience-sharing regarding the development of the LA-CoNGA physics diversity plan[19]
  - MoU signature (2020)[20]
  - attendance and participation of LA-CoNGA physics members within the GENERA community[21]
- Contact and exchange of experiences with various CBHE projects coordinated in France (management issues, legal and financial aspects)
  - E-LIVES[22], coordinated by Université de Limoges
  - MOSE-FIC and ASICIAO[23] , coordinated by Université de Technologie Troyes-
  - General interaction for CBHE projects with LA-CoNGA physics program countries partners (Université de Toulouse – Technische Universität Dresden)

[17] RedClara https://www.redclara.net/index.php/es/
[18] GENERA Network https://www.genera-network.eu/about
[19] LA-CoNGA physics diversity plan https://github.com/LA-CoNGA/WP5-Dissemination/blob/master/DiversityPlan/LA_CoNGA_Plan_de_diversidad.pdf
[20] GENERA - LA-CoNGA physics MoU signature https://github.com/LA-CoNGA/WP5-Dissemination/tree/master/DiversityPlan/GENERA
[21] LA-CoNGA physics presentation for GENERA https://docs.google.com/presentation/d/1UmOVABkfOdjad3MZN-Fx5jbjF0gjThFi/edit#slide=id.p1
[22] Erasmus+ CBHE E-LIVES project https://e-lives.eu/?page_id=319&lang=fr
[23] MOSE-FIC and ASICIAO Erasmus+ CBHE projects https://www.utt.fr/programme-erasmus/erasmus-cbhe-mose-fic

Others:

- Banco Interamericano de Desarrollo (BID)[24]
  - prospective contacts for funding opportunities beyond Erasmus+
- The Latin American Strategy Forum for Research Infrastructure (LASF4RI)[25]
  - white paper from LA-CoNGA physics for LASF4RI
  - several members of LA-CoNGA physics are part of the LASF4RI preparatory group, and José Ocariz, the LA-CoNGA physics Coordinator, is a member of the LASF4RI high-level group

[24] Banco Interamericano de Desarrollo (BID)# , the largest source of developing financing for Latin American and the Caribbean - https://www.iadb.org/es/acerca-del-bid/financiamiento-del-bid/financiamiento-del-bid%2C6028.html
[25] Latin American Strategy Forum for Research Infrastructure (LASF4RI) https://lasf4ri.org/