



LABORATÓRIO DE INSTRUMENTAÇÃO  
E FÍSICA EXPERIMENTAL DE PARTÍCULAS  
*partículas e tecnologia*

# [ LIP-ECO ]

Communication, OUTREACH & EDUCATION @ LIP  
— Selected highlights —

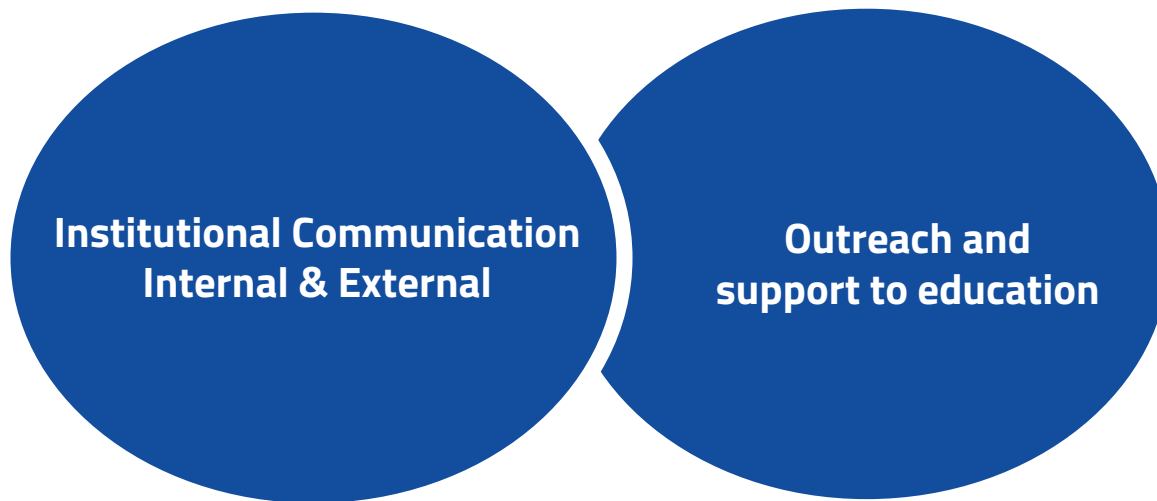


Catarina Espírito Santo, PEDRO ABREU, on behalf of the LIP-ECO Group

Jornadas do LIP, Coimbra, Jul 2022

Recall:

## LIP-ECO



Coord: Catarina Espírito Santo  
Ricardo Gonçalo (Coimbra)

Coord: Pedro Abreu  
Filipe Veloso (Coimbra)  
Nuno Castro (Minho)

*With the participation of all the LIP community*  
***All LIP nodes***

# Outreach and support to education

- Talks in schools
- Masterclasses (online or not)
- School visits to LIP
- Support to school projects
- EduLab
- Collaboration with SPF
- Ciência Viva Summer internships
- European Researchers Nights (online or not)
- Other public events
- IPPOG
- ...

*take a look at the yearly reports for details*

## Highlights

FIC.A

ONLINE CERN Portuguese  
Language Teachers Programme

**Speaker: Pedro Abreu**

# LIP Education & Outreach

## 2020

- Masterclasses – in presence only in the first 4 sessions: two at Braga, 1 at Vila Real, 1 at Bragança  
Total participation of 400 students and teachers.  
Expected participation of more 1200 students at other 10 sessions canceled.
- [Visits to CERN and LIP visits to Schools – Canceled](#)
- CERN Teachers programmes - including Portuguese Language TP – Canceled
- [Some events able online – European Researcher's Night on November 27<sup>th</sup>](#) very successful involvement of [the 3 LIP nodes](#): a virtual visit to ATLAS at 17h00 (from Braga), Debate "The science of the infinitely small" at 20h00 (from Coimbra), a virtual visit to CMS at 21h30 (from Lisboa)! Thanks Ana Peixoto and André David and José Carlos da Silva for being the virtual guides.

## 2021

- [Masterclasses – several online only, including the first Proton Therapy Masterclasses, totalizing ~400 participants in 10 virtual sessions](#)
- Back to events in presence at the [European Researchers Night](#) and at **FIC.A@Oeiras**
- [Back to talks in presence at schools \(after October\)](#)
- **ONLINE Portuguese Language Advanced Teachers Programme**
- [Support to Ciência Viva Clubs at the Schools \(9 active, 12 more proposed\)](#)

# FIC.A International Science Festival at Oeiras 12-17 October 2021

## THANKS!

### Mount/dismount:

Hugo Gomes, João Gentil, José Carlos Nogueira, Luís Afonso, Luís Gurriana, Miguel Ferreira, +PA and João Pequeno

### Researchers Support:

Ana Sofia Inácio, Catarina Espírito Santo, Catarina Quintans, João Gentil, João Martins Silva, João Pedro Gonçalves, José Patuleia Venâncio, Luís Afonso, Matteo Pisano, Miguel Martins, Pedro Assis, Ricardo Gonçalves, Rudnei Machado, Sofia Andringa, Felix Riehn, +PA

- FIC.A Organization invited CERN be presented at the Festival
- CERN put FIC.A team in contact with LIP
- LIP assumed the maintenance of CERN presence and provided its own contents for the LIP-CERN stand at the festival
- CERN contents:
  - LHC Interactive Tunnel
  - CERN In Images posters (selected)
- LIP contents:
  - Spark Chamber
  - Roll-Ups
  - Flyers and Brochures
  - TV set with videos
- Difficult negotiations to receive a minimal space
- LIP Researchers present 9h30–22h00 (3)
- LIP Staff to unpack/mount/store on October 8<sup>th</sup> – 11<sup>th</sup> and recover/dismount/pack on October 18<sup>th</sup>
- ~20k people passed through our stand

# FIC.A

## International Science Festival at Oeiras 12-17 October 2021

TV reports:

13 Oct 18h23 - RTP1 - "Portugal em Direto" (at 23'30" in the video)

<https://www.rtp.pt/play/p8156/e573032/portugal-em-direto/981697>

14 Oct 11h22 - RTP1 - Praça da Alegria (at 23'10" in the video)

<https://www.rtp.pt/play/p8250/e573177/praca-da-alegria/981919>

15 Oct 14h20 SIC - Primeiro Jornal


<https://sicnoticias.pt/pais/2021-10-15-Festival-Internacional-de-Ciencia-chegou-a-Portugal-e-conta-com-concertos-palestras-e-exposicoes-51f0a40d>






[indico.cern.ch/e/PTLTP21Online](https://indico.cern.ch/e/PTLTP21Online)

**18 - O complexo dos aceleradores de partículas é uma série de tubos com campos de forças, cada vez mais rápidos, que fazem os prótons. O acelerador que serve de injeccionador com mais energia é:**



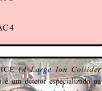
- LINAC2
- SPS
- LHC
- LHC4

**19 - O sistema de propulsão LHC é baseado num anel de 27 km, que se localiza a uma altitude de 100 metros. Immediatamente abaixo da superfície, numa zona livre de perturbações, há um túnel subterrâneo de 4 metros de diâmetro. Este sistema serve para:**



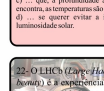
- ... a criação de uma nova forma de vida alienígena.
- ... o bóson de Higgs, a supersimetria e as dimensões extras do universo.
- ... as colisões-tesão existentes na matéria escura vermelha.
- ... os bósons  $W$  e  $Z$ .

**20 - O ALICE (Large Ion Collider Experiment) é um detector especializado na produção de colisões de íons pesados. O objetivo principal do ALICE é estudar:**



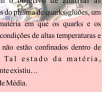
- ... a estrutura interna dos núcleos atômicos.
- ... se o quark está confinado em hádrons.
- ... a profundidade a que o LHC se encontra, a temperatura da matéria nuclear.
- ... se o quark evita a interferência da luminosidade solar.

**21 - O LHC (Large Hadron Collider) é o maior acelerador de partículas do mundo. Ele é capaz de atingir velocidades próximas à da luz. A principal finalidade do LHC é:**



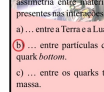
- ... entre a Terra e a Lua.
- ... entre partículas que contém o quark bottom.
- ... entre os quarks tu, de maior massa.
- ... entre glúons e fótons, de massa zero.

**22 - O CMS (Compact Muon Solenoid) é um detector de partículas que se encontra no túnel subterrâneo do LHC. O seu objetivo principal é:**



- ... estudar a estrutura interna dos núcleos atômicos.
- ... se o quark está confinado em hádrons.
- ... a profundidade a que o LHC se encontra, a temperatura da matéria nuclear.
- ... se o quark evita a interferência da luminosidade solar.

**23 - O CMS (Compact Muon Solenoid) é um detector de partículas que se encontra no túnel subterrâneo do LHC. O seu objetivo principal é:**



- ... estudar a estrutura interna dos núcleos atômicos.
- ... se o quark está confinado em hádrons.
- ... a profundidade a que o LHC se encontra, a temperatura da matéria nuclear.
- ... se o quark evita a interferência da luminosidade solar.

05/13

## // The problem



### Pandemics...

- Hit hard all CERN's Teachers programmes and Teachers visits to CERN
- Hit hard all the schools, teachers and students activities w/ scientists
- 2020 got us "by surprise", and not really prepared for online alternatives
- Reaction – as programmes for teachers – came in 2021

### The challenge

- Following good examples, propose an attractive ONLINE programme
- Online => Teachers are working at the schools => avoid school hours
- International => different timezones, different school hours
- Online => network issues (in some places), attendance of participants
- How NOT to make it a "2<sup>nd</sup> hand" programme, replacing the standard CERN's Portuguese Language Teachers Programme



## // The solution



# An Advanced Online Programme

- **Advanced:** update on the contents and level w.r.t. previous programmes
- **ONLY** for participants of previous Portuguese Language Teachers Programmes and CERN's International Teachers Programmes
- [more] Advanced level courses
- **Not repeating previous sessions, but propose to build from those**
- **No [in-person] visits to CERN Laboratories (or others, for that matter)**
- **...but Virtual Visits possible!**
- **New topics less covered in previous programmes (normal)**
- **Maintain interactions between teachers, between teachers and speakers, a friendly and cooperative atmosphere**

# // The [Advanced] ONLINE Portuguese Language Teachers Programme 2021



- Duration of 34 hours spread along 3 weeks
- Strong focus on Standard Model of Particle Physics
- Other areas well covered
- Sessions for the immediate and long-term future
- Sessions for sharing experiences (post [previous] School)
- Hands-on sessions
- Practice sessions in groups (in Zoom separate rooms)
- Work to be developed by the groups (a classroom plan/activity/etc)
- Presentations of the works prepared by the heterogeneous groups
- “tight control” of presence allows for authorized certification
- Evaluation of the programme by the participants

## // Participants

(limited to 20 PT+20 BR + 2 AO + 2 MZ + 1 (CV, STP, TL, GB))



- 19 PT Teachers (Portugal)
- 19 BR Teachers (Brazil)
- 2 AO Teachers (Angola)
- 1 MZ Teacher (Mozambique)
- 1 CV Teacher (Cape Verde)

**PT and BR teachers from all  
over the country(ies)**

# // All ONLINE and in Indico



<https://indico.cern.ch/e/PTLTP21Online>

- 02–20 November 2021
- 18h00–22h00 (15h00–19h00 BRT) or 13h00–17h00 (10h00–14h00 BRT) on [alternate] weekdays
- 13h00–17h00 (10h00–14h00 BRT) on Saturdays
- All [theory] sessions recorded and made available for the participants
- Training for Masterclasses
  - ALTAS-Z/W,
  - CMS-WZH,
  - Proton Therapy MC,
  - Auger (test)
- Virtual Visits to ATLAS, CMS, Sirius (the BR big lightsource laboratory)

## // [preliminary] Feedback



- Very enriching programme
- Internet issues in some places or at some times
- Availability of participants (2/3 at least required for validation)
- Very intense and high rhythm
- Hands-on sessions very enlightening and useful
- Virtual Visits very successful, entertaining, important
- Too much work to accomplish
- ...but fruitful
- Exhaustive for the speakers/organizers
- Repetition period to be defined  
(not yearly, but maybe every other year)
- Globally a wonderful experience (for everyone involved)

## // Conclusions



- Education, Communication and Outreach are essential pillars for the development of High Energy and Particle Physics.
- Many scientists, at different levels of commitment, along with experts in outreach and communication, are already **engaging the public** in different venues and carry outwards the excitement of the field.
- Outreach in our field needs **YOUR support and contribution**,
  - as actively being an **ambassador** of the field,
  - as speaker/moderator/motivator/organiser/educator/tutor,
  - as **evaluator** of projects/career assessment/applications/positions,
  - and/or helping creating the conditions for a better Edu-Comm-OR in HEP.

**O\_TREACH is not complete without U**





*Planting  
a future*

# Thanks!

(this is a big thanks!)

to all the people collaborating in all these activities!  
...and for your attention!

## Any questions?

You can find me at [abreu@lip.pt](mailto:abreu@lip.pt)

**FCT** Fundação  
para a Ciência  
e a Tecnologia

 **REPÚBLICA  
PORTUGUESA**



**CIÊNCIA VIVA**  
Agência Nacional para a Cultura  
Científica e Tecnológica



# ECO needs everyone's collaboration!

questions? suggestions? willing to participate?  
[outreach@lip.pt](mailto:outreach@lip.pt)