LABORATÓRIO DE INSTRUMENTAÇÃO
E FÍSICA EXPERIMENTAL DE PARTÍCULAS
partículas e tecnologia

[LIP-ECO]

Communication, outreach, education and advanced training @ LIP

— Selected highlights —

Ana Sofia Inácio, Luis Afonso, Nuno Leonardo, on behalf of the LIP-ECO Group

Jornadas do LIP, Braga, Feb 2020

LIP-ECO

Institutional Communication
Internal & External

Outreach and
support to education

Advanced
training

Coord: Catarina Espírito Santo
Ricardo Gonçalo (Coimbra)

Coord: Pedro Abreu
Filipe Veloso (Coimbra)

Coord: Nuno Castro & Nuno Leonardo

With the participation of all the LIP community
All LIP nodes

LIP-ECO

Institutional Communication Internal & External

- Yearly Reports & Plans
- Evaluation
- LIP-News Bulletin
- Site news and maintenance
- Social media
- Media relations
- cLIP digital Newsletter
- Event dissemination
- Comm with and for students
- EPPCN
- GENERA: Gender Equal. Network
- ...

Outreach and support to education

- Talks in schools
- Masterclasses
- CERN PT Teachers programme
- Other Teacher Training Progs.
- Schools visits to LIP
- Support to school projects
- EduLab
- Collaboration with SPF
- Summer internships
- European Researchers Nights
- IPPOG
- ...

Advanced training

- LIP Internship Programme
- Research projects
- (under)graduate courses
- Schools and workshops
- Seminars and hands-on tutorials
- PhD programmes management
- Participation in Univ events
- Inside views, ENEF
- LIP Room at IST
- LIP student workshops
- Training future trainers in RP+NT
- ...

Will select a highlight from each... take a look at the yearly reports for details

Selected highlights

Institutional Communication Internal & External

An internal & external communications project

Communication with & for students

Speaker: Ana Sofia Inácio

Outreach and support to education

Developing the experimental side

Support to lab projects in schools and at LIP: an example

Speaker: Luis Afonso

Advanced training

Attracting students to LIP

LIP
Summer Internships

Speaker: Nuno Leonardo

Institutional Communication Internal & External

- Yearly Reports & Plans
- Evaluation
- LIP-News Bulletin
- Site news and maintenance
- Social media
- Media relations
- cLIP digital Newsletter
- Event dissemination
- Comm with and for students
- EPPCN
- …

take a look at the yearly reports for details

Highlight

Communication with & for students

An internal & external communication project

Speaker: Ana Sofia Inácio

Communication with & for students

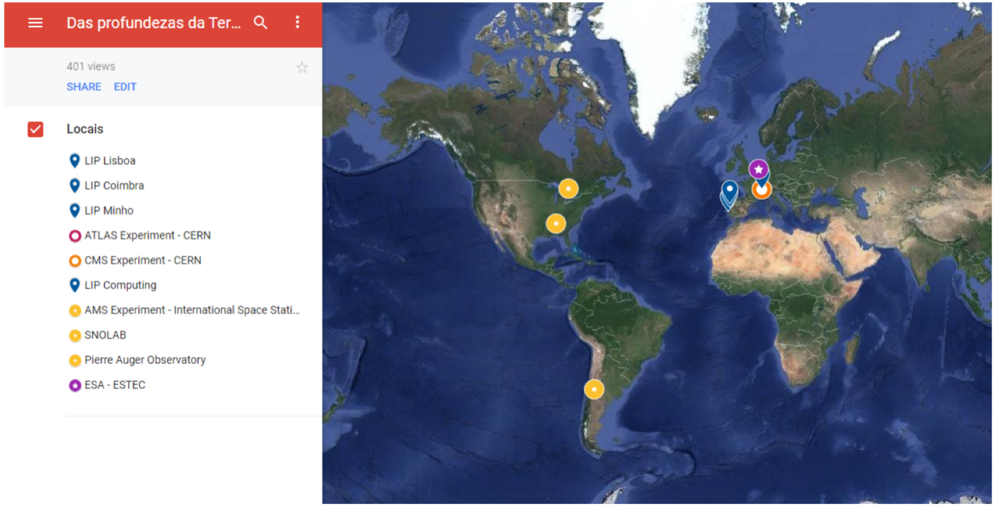
Getting LIP PhD & Master students more involved in outreach

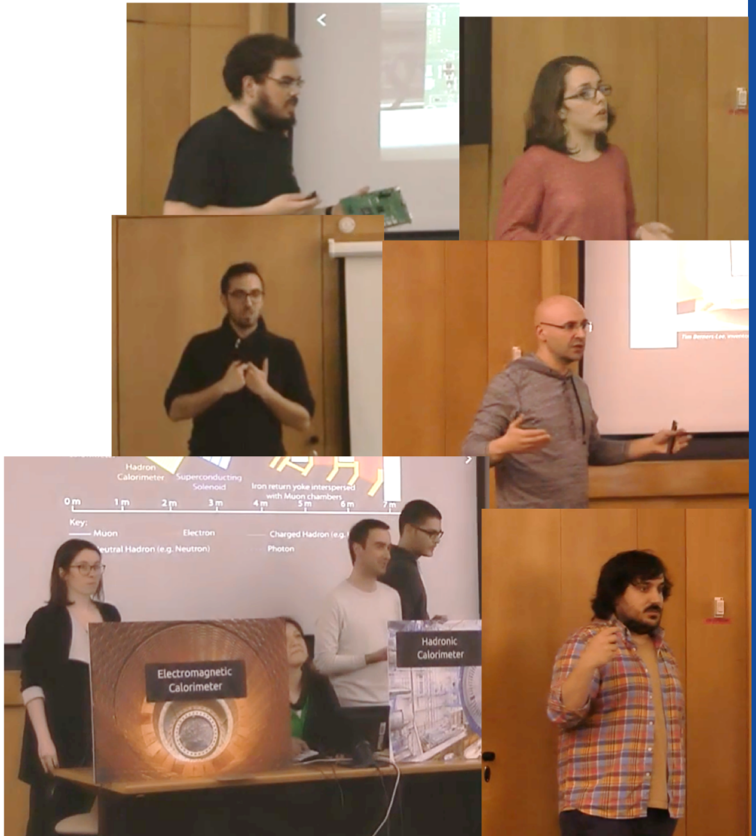
- Provide students with some formal training and practice in science communication
- get the young members from different groups to work together
- Benefit from the fact that young people are closer to school public

“LIP - Das Profundezas da Terra ao Espaço”
9th of May, 2018

Celebration of the 32nd LIP Anniversary

Full auditorium, with around 80 secondary school students and teachers





“Partículas: do Universo ao Laboratório”
11th of February, 2019

Celebration of the International Day of Women and Girls in Science

Two sessions with full auditorium, around 140 secondary school students and teachers

Acção de formação “Falar em Público” com José Vítor Malheiros

10th January 2018 –12 people from LIP-Lisboa, Coimbra and Minho

30th January 2019 – 8 people from LIP-Lisboa

Objectives

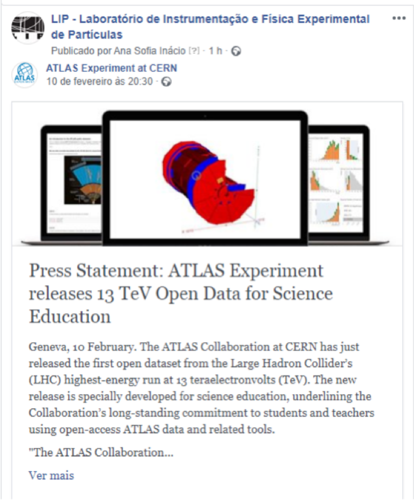
- Internalize the distinction between the objectives of peer communication and communication with lay people

- Acquire basic skills in oral communication on scientific topics

Using Social Media to Our Advantage

National and International Outreach

- Share LIP news, events and achievements of the experiments/areas LIP is connected to.



Using Social Media to Our Advantage

National and International Outreach

- Share LIP news, events and achievements of the experiments/areas LIP is connected to.

- Share knowledge and educate the general public.

Celebration of the 150 Years of the Periodic Table

- 47 riddles about periodic table elements every week throughout 2019
- Questions/answers relating each element to a topic in particle physics

Using Social Media to Our Advantage

National and International Outreach

The future – show what is done at LIP, by the researchers and students

Outreach and support to education

- Talks in schools
- Masterclasses
- CERN PT Teachers programme
- Schools visits to LIP
- Support to school projects
- EduLab
- Collaboration with SPF
- Summer internships
- European Researchers Nights
- IPPOG
- ...

take a look at the yearly reports for details

Highlight

Developing the experimental side

Support to lab projects
in schools and at LIP:

The example of AE Benfica

Speaker: Luis Afonso

LIP-EduLab

Reinforcing experimental activities proposed to high-school students

2018 / 2019

"Particle Physics and its tools" (F. Barão, C. Esp Santo, A.S. Nunes)

- "Ciência Viva in the Laboratory" internships
- "Cientificamente Provável" programme with ES D. Filipa de Lencastre and ES Restelo (Lisboa)
- Support to projects proposed by the teachers/students: AE Benfica (Lisboa), AE Joane (Minho)
- Collaboration with LIP-Minho: working towards similar goals (R. Sarmento, N. Castro, H. Carvalho, J. Alves)
- Thanks for the support from LIP-Coimbra and e-CRLab (F. Neves, L. Lopes, JC. Nogueira, M. Ferreira, P. Assis)

2019 / 2020

Focus on development: new projects and equipment

- A wider team in Lx: Márcia Quaresma, Marco Pinto, Nuno Barros, L. Afonso, P. Abreu, P. Assis, F. Barão, C. ES, ...
- People and ideias welcome!
- For schools:
  - Support to projects developed by the schools
  - Visits to LIP: talk + cloud chamber workshop

AE Benfica example

- Participation in events
- EduLab/Física das Coisas
- LIP impact on students

Maker Space

Física das Coisas

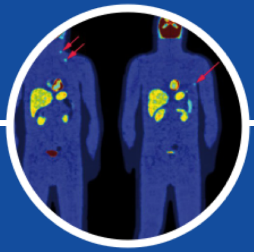
www.fisicadascoisas.pt

Coordinator: Luis Afonso

luis.fonso@fisidascoisas.pt

1.
Participation in events

With students
As a teacher



Participation in Events
Students

Talks and Workshops at LIP

From the depths of Earth to Space

Artificial Intelligence & Machine Learning and Particle Physics - NL

Particles: From the Universe to the Laboratory" in the celebration of the international day of women and girls in Science

European researchers night at Planetário CG

National week of scientific and technological culture: the 20 years of the Pierre Auger observatory

International MasterClasses in Particle Physics

LIP Talks in School

"Infinitely large and infinitely small - The Void and the Higgs Boson" R. Gonçalo

"Angels, Demons, Matter, Antimatter and what else is done at CERN" P. Abreu

"Cosmic Rays - a challenge for space travel!" L. Arruda

LIP/SPF activities with Students

Schools visits to CERN and S’Cool Lab

National Physics Olympics (SPF)

IPhO International Physics Olympics 2018 (SPF) Lisbon

LIP activities as a teacher

Ciência Viva - Hackathon Mars Lousal Mine 2019
(P. Gonçalves and P. Assis)

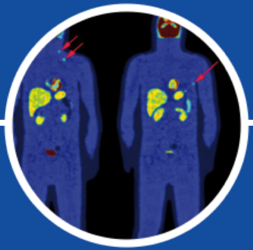
CERN – PT Teachers Programme 2018 (P. Abreu)

CERN - The International Teacher Weeks (ITW) Programme 2019

2.

EduLab/
Física das Coisas (*)

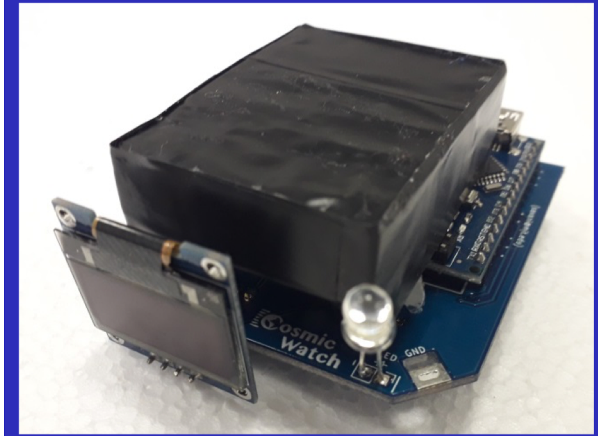
Cosmic Watch
Photogate communication
Cloud Chambers



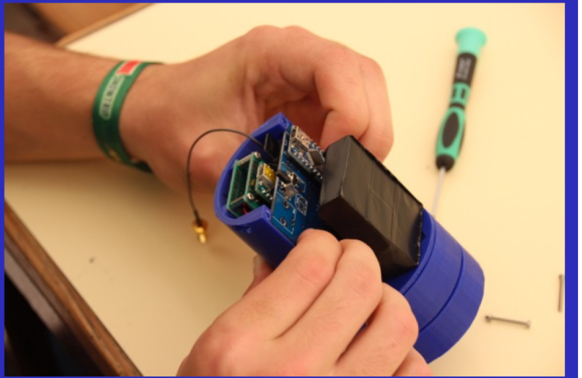
(*) Physics of things

EduLab / Física das coisas

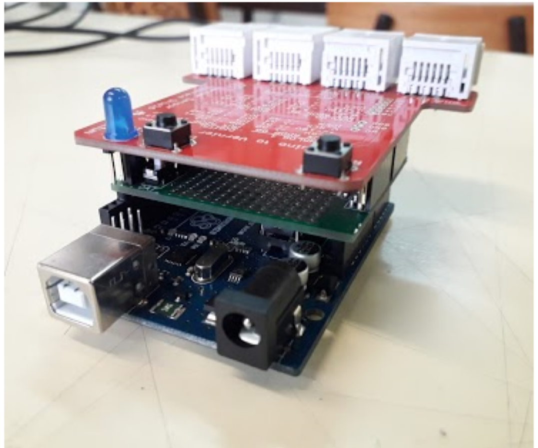
Cosmic Watch (C. Esp. Santo, F. Neves, J. Nogueira, M. Ferreira)



CanSat 2019 Ciência Viva



Photogate Communication (N. Barros)



EduLab / Física das coisas

Cloud Chambers (C. Espírito Santo and P. Abreu)

S' Cool Lab at CERN

"Física das Coisas" Space Maker

EduLab / Física das coisas

Cloud Chambers (C. Espírito Santo and P. Abreu)

Teachers WorkShop in Casa das Ciências

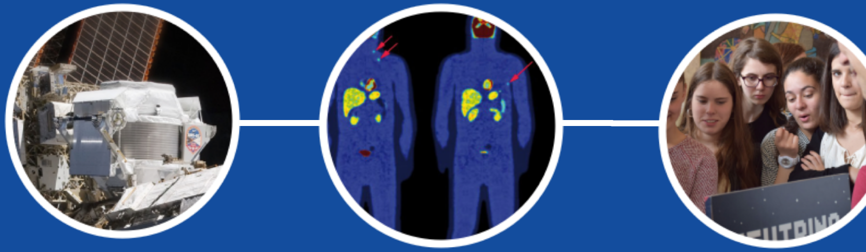
European researchers night at Planetário CG

National week of scientific and technological culture

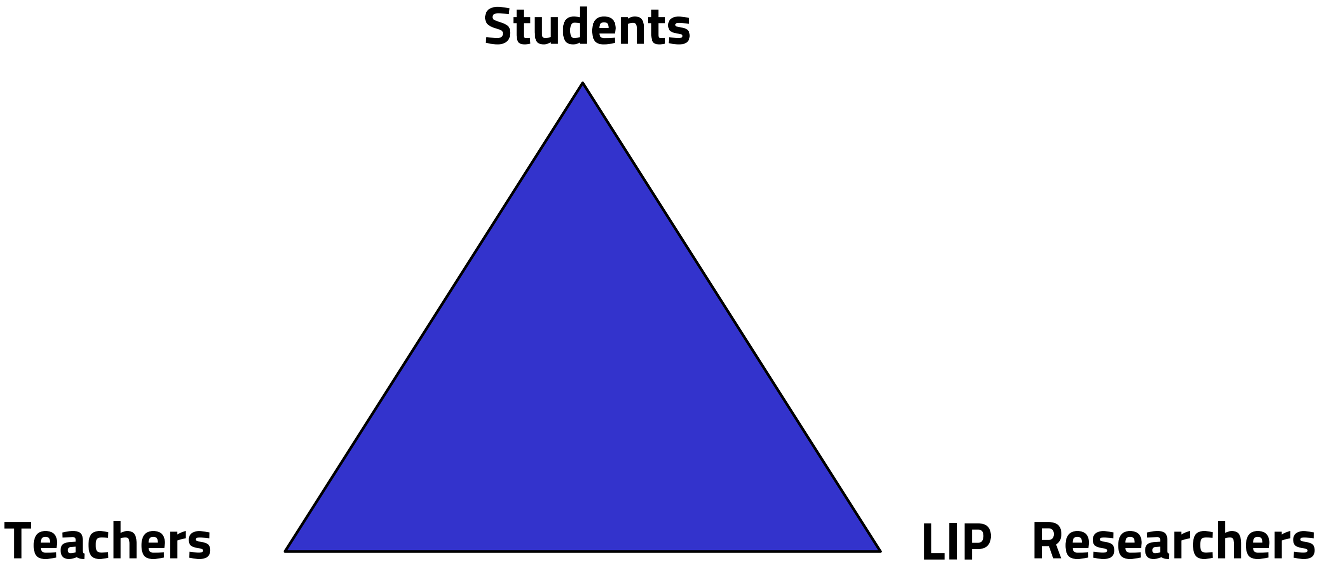
3.

LIP Impact on students

Learning
What students and parents think



Learning



What Students and Parents Think

“The visit to the laboratories (LIP) and CERN completely changed my choice of course, I want to go to Physics". (J.)

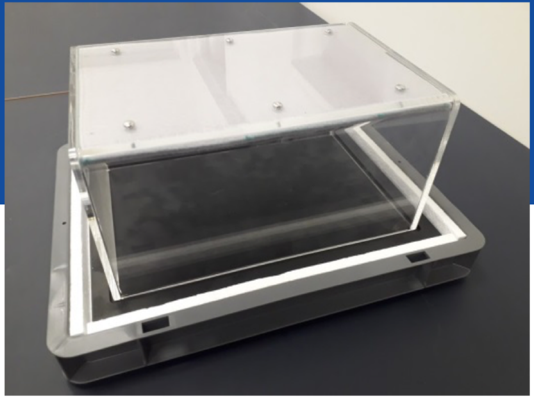
“Because I built the Cosmic Watch and participated in CanSat I was admitted on an internship ...". (C.)

“With the coming of that researcher (L. Arruda) at school I already know which course I will choose“. (M.)

“You can't imagine how all your particle activities were important for my son's course choice”. (R. mother)

“... the participation in these projects (with LIP) radically changed my son’s course option”. (T. mother)

Thanks!



www.fisicadascoisas.pt

luis.afonso@aebenfica.pt

Advanced training

- LIP Internship Program
- Research projects
- (under)graduate courses
- Schools and workshops
- Seminars and hands-on tutorials
- PhD programs management
- Participation in Univ events
- Inside views, ENEF
- LIP room at IST
- LIP student workshops
- Training future trainers in RP+NT
- ...

take a look at the yearly reports for details

Highlight

engage+support students in research

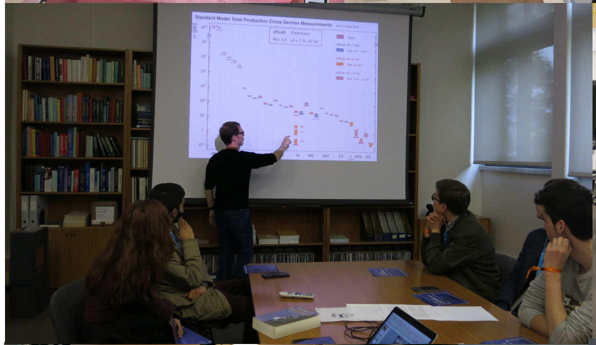
LIP Internship Programme

Speaker: Nuno Leonardo

Attract university physics students

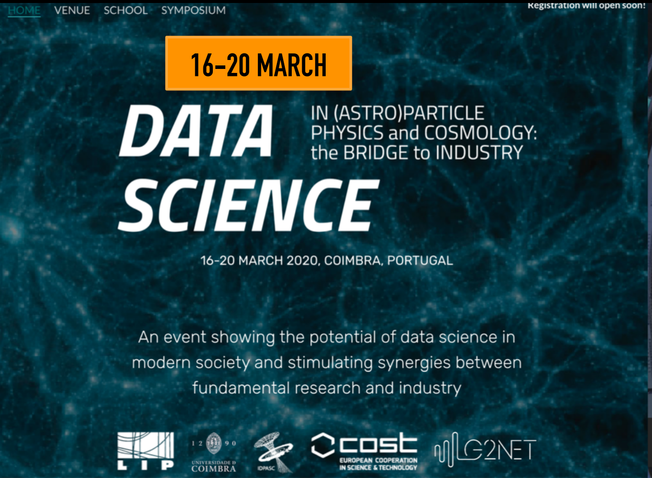
- receive university physics students from first years @LIP
- take part in events @University
- important first contact students have with LIP and what we do

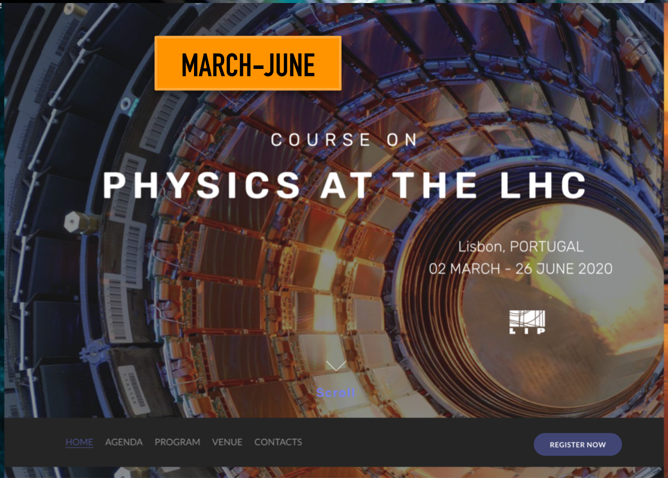
Events at LIP, FCUL, Coimbra, Minho,
Activities at LIP room at IST
Colloquia, seminars, graduates chats with undergraduates, PubhD



Engage students in our research

- **Internships**
- Schools
- Courses
- Workshops





Graduate research opportunities+support

PhD programs | Schools | Workshops

LIP Internship Program | LIP²

lip.pt/estagios-de-verao

indico.lip.pt/category/36/

cern.ch/lip/si/

training@lip.pt

- LIP flagship program — involving all three poles and all research groups
- undergraduate physics students become scientific collaborators
  on research projects for a two-month period over summer
- students take part in lectures, topical discussions and hands-on tutorials,
  carry out a research project, and present results at final workshop

Organization

03 ▪ project **submission** by researchers
04 ▪ **announcement**
  ▪ website | poster | social media presentations at universities
▪ student **application**
05 ▪ project assignment
06
  ▪ student+supervisor ranking
07 ▪ **tutorials** week
▪ **project development**
08 ▪ **mid-term** gatherings
09 ▪ final **presentations**
  ▪ 2-day workshop
10 ▪ **papers:** editing | review

Most recent innovations (2019)

- **Lectures**
  - reduce lecture time
  - added “topical chats”
- **Tutorials**
  - students have choice
  - e.g. to match background / interests
- **Mid term**
  - “August chats”
  - students present their planned topics to colleagues
- **Research papers**
  - students offered possibility to write research paper 5-10 pages long

Induction Tutorials

Introductory lectures

+

Thematic discussion

+

Hands-on exercises

Mid-term activities

'August Chats'

Student seminar weekly Sessions

(Students present to colleagues a problem they are addressing)

after-work party in the garden

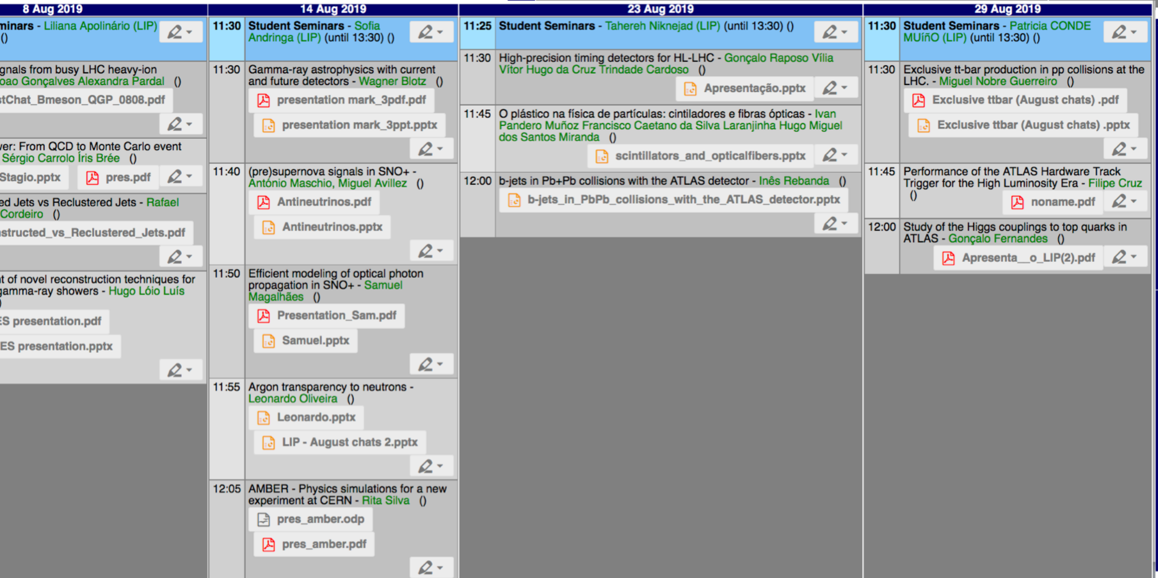




ESTÁGIOS


Agenda
(2019)

- 11-days worth of meetings



3 editions and counting

	2017 1st edition	2018 2nd edition	2019 3rd edition
Projects proposed		40	38
Applications received		95	78
Students selected/presented	41	63	68/55
Presentations	16	30+3	30

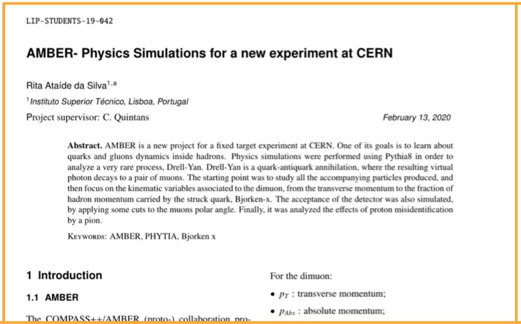
Large increase since 1st edition — have now reached **sustainable** plateau.

Group	Total
ATLAS	7
Auger	2
Auger/ECO	1
CMS	5
COMPASS	2
DM/ATLAS	1
Dosimetry	1
DUNE	1
LATTES	2
MuTom	3
NUC-RIA	4
Pheno	1
SHiP	1
SNO+	3

2019

Research papers

proposal (to CC)
reference schema: LIP-STUDENT-19-007
made available from public database



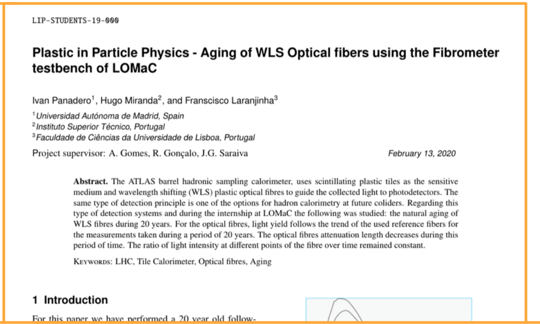
LIP-STUDENTS-19-042

AMBER- Physics Simulations for a new experiment at CERN

Rita Ataíde da Silva[1,a]
[1] Instituto Superior Técnico, Lisboa, Portugal
Project supervisor: C. Quintans — February 13, 2020

Abstract. AMBER is a new project for a fixed target experiment at CERN. One of its goals is to learn about quarks and gluons dynamics inside hadrons. Physics simulations were performed using Pythia8 in order to analyze a very rare process, Drell-Yan. Drell-Yan is a quark-antiquark annihilation, where the resulting virtual photon decays to a pair of muons. The starting point was to study all the accompanying particles produced, and then focus on the kinematic variables associated to the dimuon, from the transverse momentum to the fraction of hadron momentum carried by the struck quark, Bjorken-x. The acceptance of the detector was also simulated, by applying some cuts to the muons polar angle. Finally, it was analyzed the effects of proton misidentification by a pion.

Keywords: AMBER, PHYTIA, Bjorken x



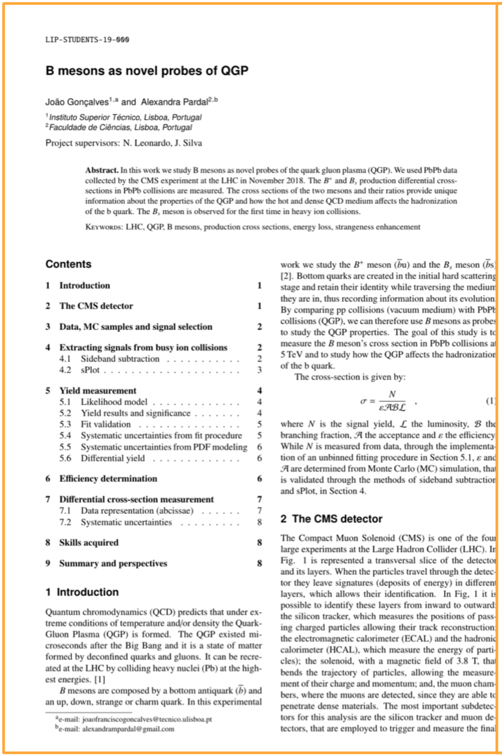
LIP-STUDENTS-19-000

Plastic in Particle Physics - Aging of WLS Optical fibers using the Fibrometer testbench of LOMaC

Ivan Panadero[1], Hugo Miranda[2], and Francisco Laranjinha[3]
[1] Universidad Autónoma de Madrid, Spain
[2] Instituto Superior Técnico, Portugal
[3] Faculdade de Ciências da Universidade de Lisboa, Portugal
Project supervisor: A. Gomes, R. Gonçalo, J.G. Saraiva — February 13, 2020

Abstract. The ATLAS barrel hadronic sampling calorimeter, uses scintillating plastic tiles as the sensitive medium and wavelength shifting (WLS) plastic optical fibres to guide the collected light to photodetectors. The same type of detection principle is one of the options for hadron calorimetry at future colliders. Regarding this type of detection systems and during the internship at LOMaC the following was studied: the natural aging of WLS fibres during 20 years. For the optical fibres, light yield follows the trend of the used reference fibers for the measurements taken during a period of 20 years. The optical fibres attenuation length decreases during this period of time. The ratio of light intensity at different points of the fibre over time remained constant.

Keywords: LHC, Tile Calorimeter, Optical fibres, Aging



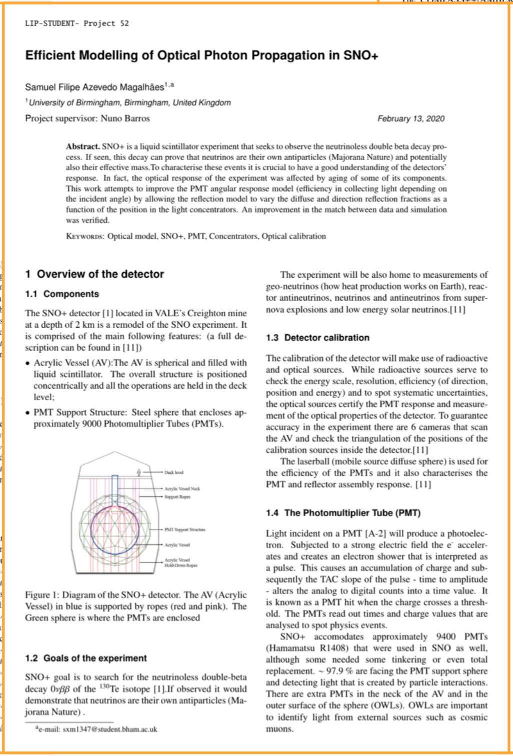
LIP-STUDENTS-19-000

B mesons as novel probes of QGP

João Gonçalves[1,a] and Alexandra Pardal[2,b]
[1] Instituto Superior Técnico, Lisboa, Portugal
[2] Faculdade de Ciências, Lisboa, Portugal
Project supervisors: N. Leonardo, J. Silva

Abstract. In this work we study B mesons as novel probes of the quark gluon plasma (QGP). We used PbPb data collected by the CMS experiment at the LHC in November 2018. The B^+ and B_s production differential cross-sections in PbPb collisions are measured. The cross sections of the two mesons and their ratios provide unique information about the properties of the QGP and how the hot and dense QCD medium affects the hadronization of the b quark. The B_s meson is observed for the first time in heavy ion collisions.

Keywords: LHC, QGP, B mesons, production cross sections, energy loss, strangeness enhancement



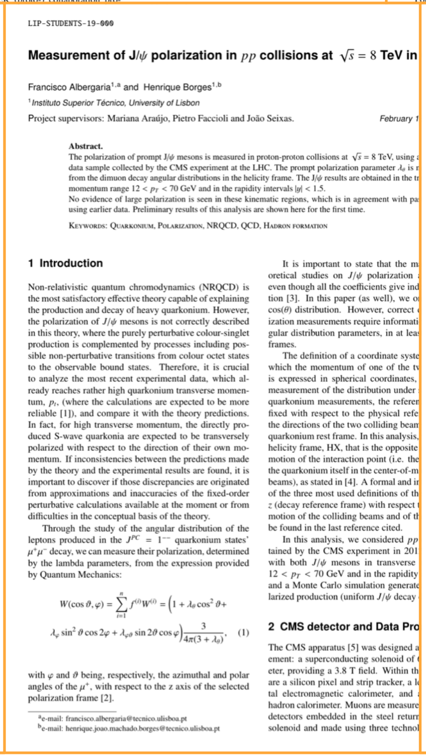
LIP-STUDENT- Project 52

Efficient Modelling of Optical Photon Propagation in SNO+

Samuel Filipe Azevedo Magalhães[1,a]
[1] University of Birmingham, Birmingham, United Kingdom
Project supervisor: Nuno Barros — February 13, 2020

Abstract. SNO+ is a liquid scintillator experiment that seeks to observe the neutrinoless double beta decay process. If seen, this decay can prove that neutrinos are their own antiparticles (Majorana Nature) and potentially also their effective mass. To characterise these events it is crucial to have a good understanding of the detectors' response. In fact, the optical response of the experiment was affected by aging of some of its components. This work attempts to improve the PMT angular response model (efficiency in collecting light depending on the incident angle) by allowing the reflection model to vary the diffuse and direction reflection fractions as a function of the position in the light concentrators. An improvement in the match between data and simulation was verified.

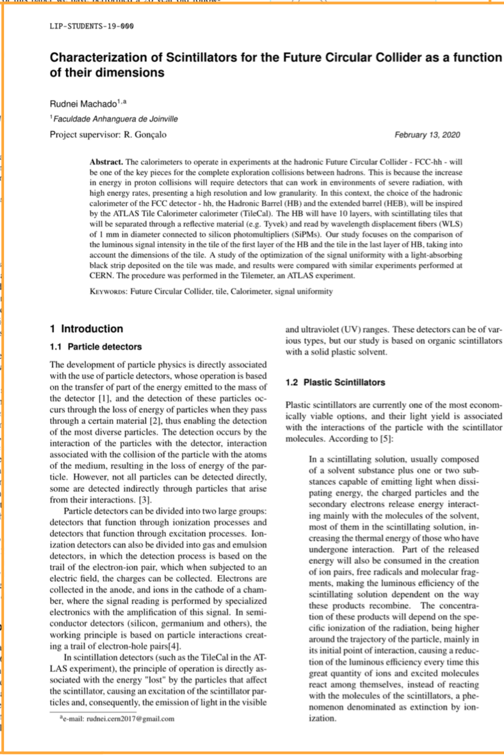
Keywords: Optical model, SNO+, PMT, Concentrators, Optical calibration



LIP-STUDENTS-19-000

Measurement of J/ψ polarization in pp collisions at $\sqrt{s} = 8$ TeV in

Francisco Albergaria[1,a] and Henrique Borges[1,b]
[1] Instituto Superior Técnico, University of Lisbon
Project supervisors: Mariana Araújo, Pietro Faccioli and João Seixas.



LIP-STUDENTS-19-000

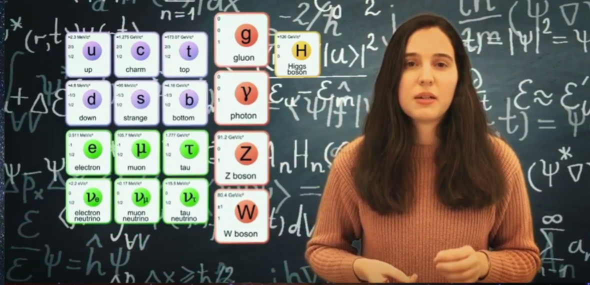
Characterization of Scintillators for the Future Circular Collider as a function of their dimensions

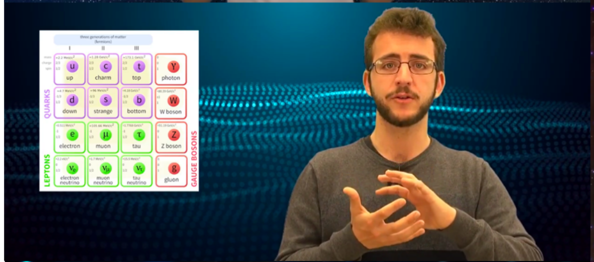
Rudnei Machado[1,a]
[1] Faculdade Anhanguera de Joinville
Project supervisor: R. Gonçalo — February 13, 2020

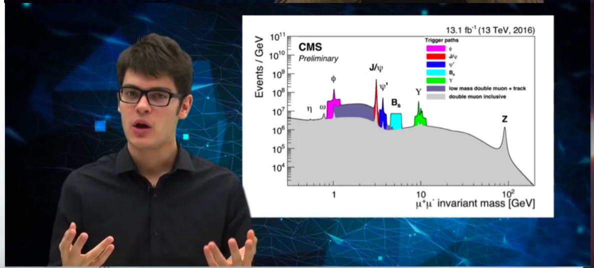
Keywords: Future Circular Collider, tile, Calorimeter, signal uniformity

Student work dissemination

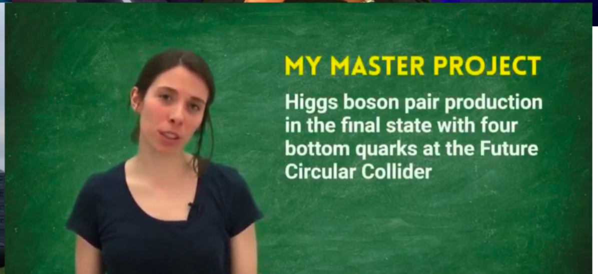
- outreach videos
- student papers
- theses **LIP-THESIS-19-007**









ECO needs everyone's collaboration!

questions? suggestions? willing to participate?

outreach@lip.pt