Adri Moreno

- Born in Málaga
- Graduated in Physics and Maths
- Working on formal aspects of **EFT**
- I also like cats

Ultra High Energy Cosmic Ray Anisotropies

Alberto Gálvez Ureña

Institute of Physics of the Czech Academy of Science

CEICO

I make maps

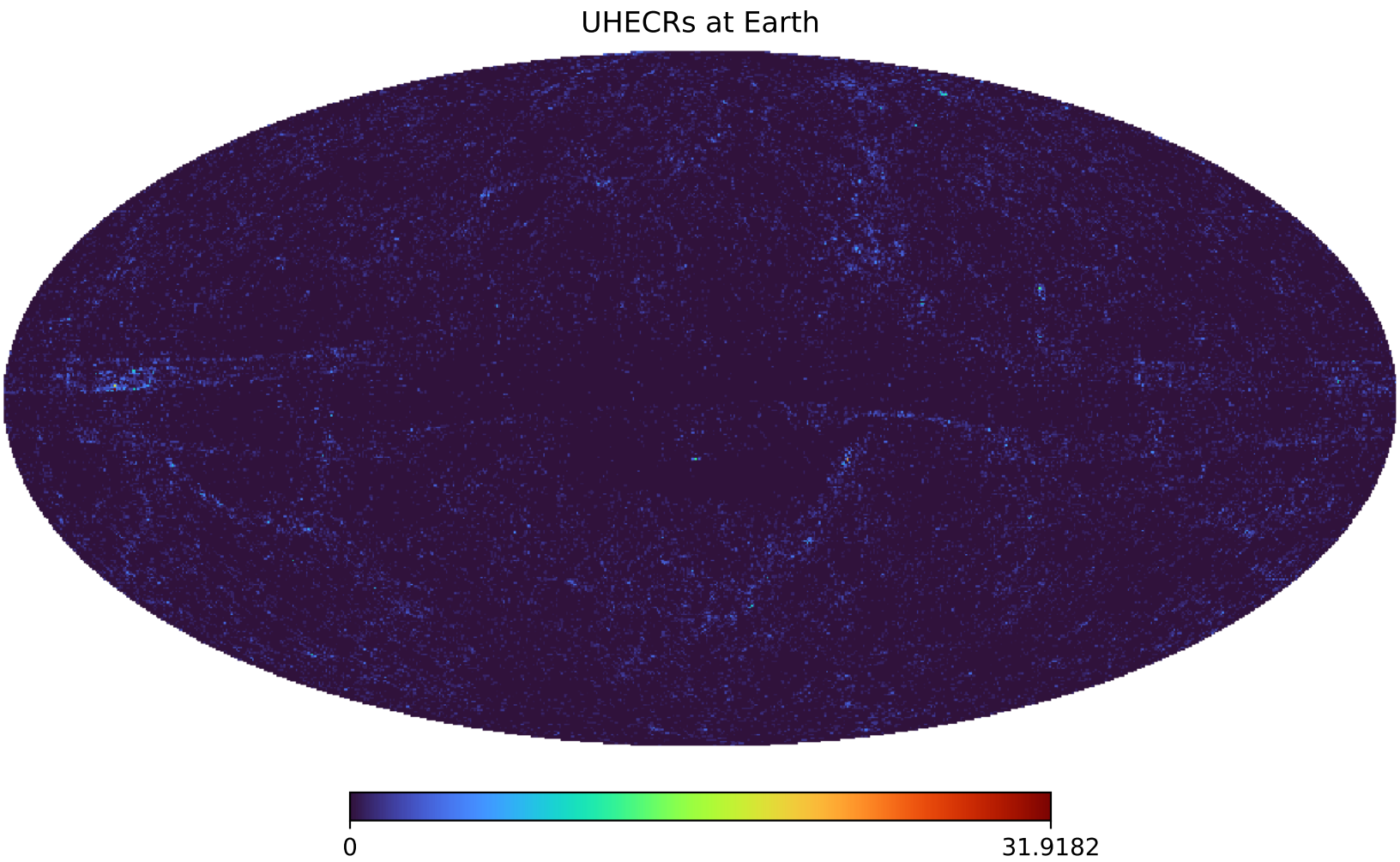


Figure: A Ultra High Energy Cosmic Ray (UHECR) map.

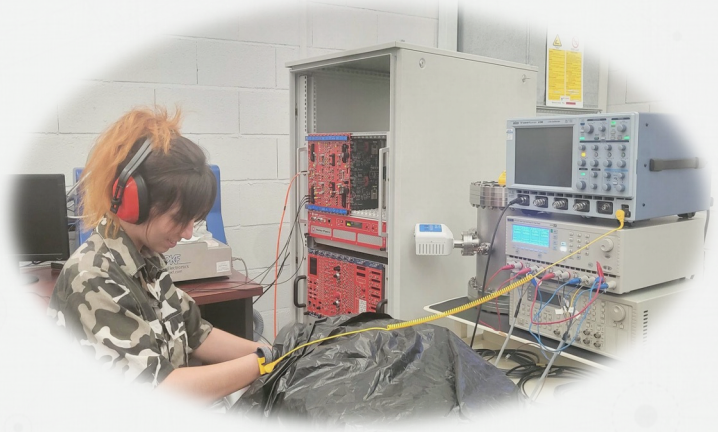
Steps for a Map of UHECRs

- Define the sources of UHECRs (Starburst galaxies, AGNs, TDEs...)
  - Position (All galaxies in 2MASS redshift survey farther than 5Mpc)
  - Chemical composition (All protons)
  - Injection spectrum ($\gamma = 2.6$)
- Extragalactic propagation effects:
  - Redshift (Given by 2MASS redshift survey and Cosmicflows-4)
  - Interactions with Cosmic Microwave Background and Extragalactic Background light (Calculated with Simprop and Prince)
  - Extragalactic Magnetic Fields (Ignored)
- Effect of the Galactic Magnetic Field (Model PT11)

What I am working on

- Work with real data from:
  - Telescope Array (TA) - Northern hemisphere
  - Pierre Auger Observatory (PAO) - Southern hemisphere
- Analyse the data using harmonic and angular auto- and cross-correlations (with other maps such as galaxy map)
- Compare with simulated maps

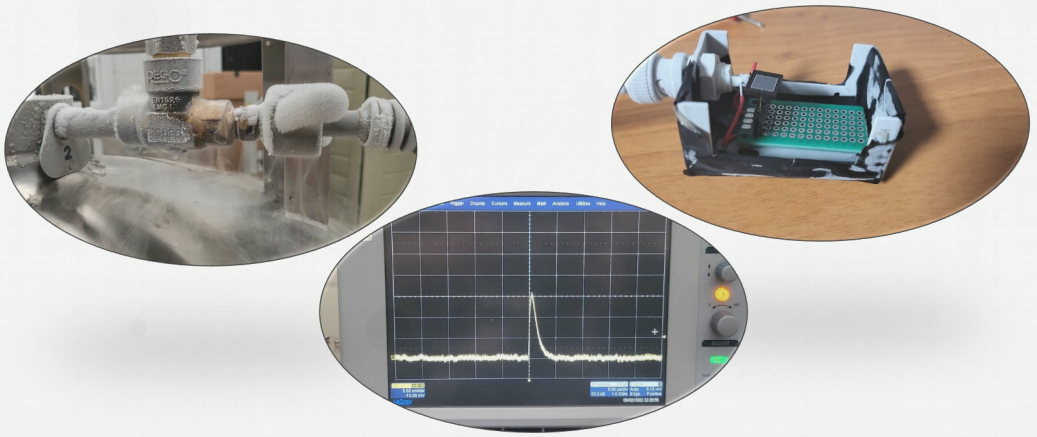
Alicia Vázquez Ramos



University of Granada (Spain)
Experimental Neutrino Physics Group

neutrino.ugr.es

aliciavr@ugr.es



Sept. 2021

Bachelor's degree on Computer Engineering:
Information Systems – UJA

Bachelor's thesis on
Differential Evolution Algorithms

Computer Engineer on
Solar Corona Physics
IAA – CSIC (Solar Physics Group)

Oct. 2021

Computation of Solar Corona with **Geometric Algorithms**

Sept. 2022

Starting Master's degree on Physics
Particles and Astrophysics – UGR

Predoctoral Researcher on
Experimental Neutrino Physics
UGR (Experimental Neutrino Physics Group)

Jan. 2023

Finishing Master's thesis on
VUV SiPMs for future neutrino experiments

Ana Andrade

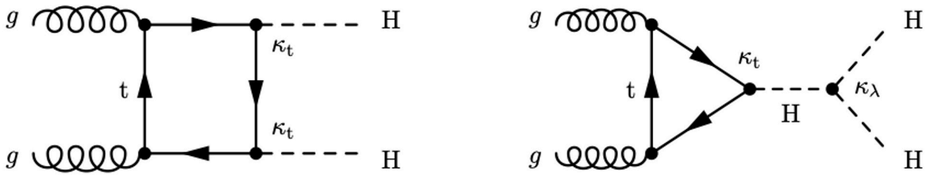
Born in Northern Portugal (Guimarães)

BSc at King's College London

MSc at RWTH Aachen

PhD at University of Hamburg (May 2023)

Higgs self-coupling with the CMS experiment; final state: HH→ $bb\tau\tau$



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BMBF FSP-CMS

Jetography in Heavy Ion Collisions

André Cordeiro (LIP/IST)

Supervisors:

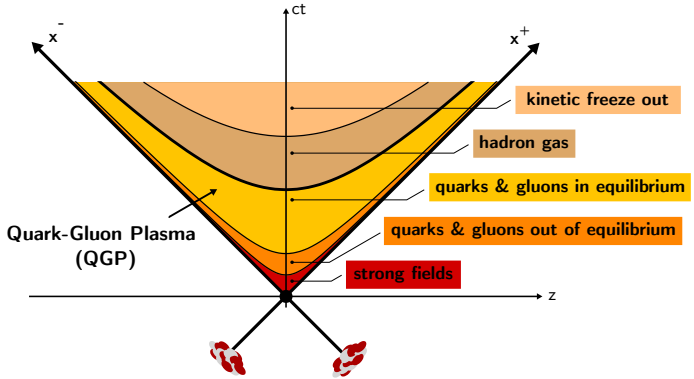
Liliana Apolinário (LIP/IST)

Guilherme Milhano (LIP/IST)

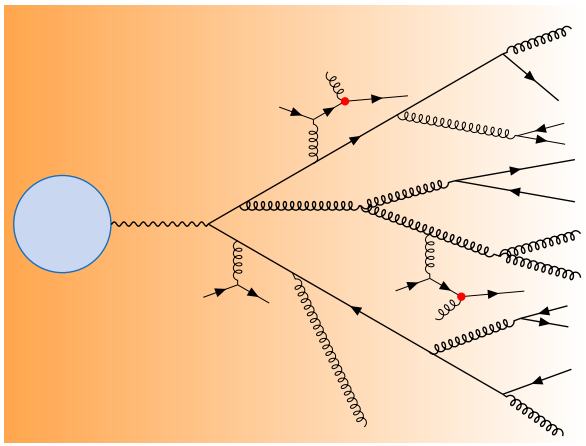
Néstor Armesto (IGFAE/USC)

12th International IDPASC school

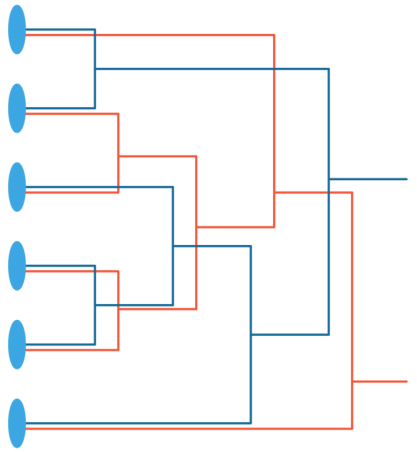
September 2023, Granada, Spain



Heavy Ion Collisions unlock a novel state of matter!



This medium is probed by radiation from collision products



Accessed by clustering hadrons into jets

What is the spacetime evolution of the QGP?

LABORATÓRIO DE INSTRUMENTAÇÃO
E FÍSICA EXPERIMENTAL DE PARTÍCULAS

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Measurement of Lepton Flavour Universality in top quarks pairs events at CMS

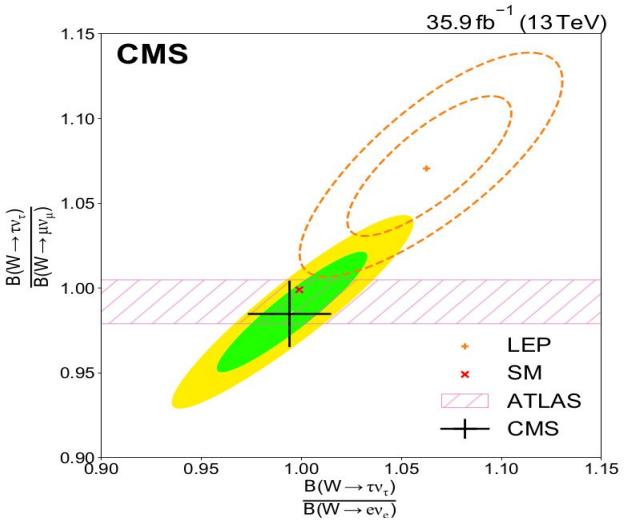
Da Molin Giacomo

CMS Physics Group of LIP Lisboa

12th International IDPASC school, 18-28 September 2022

Aim of the thesis

The Standard Model predicts **Lepton Flavour Universality**, meaning that all charged leptons have the same weak coupling. Deviation from this behaviour would be a clear signal of New Physics.



http://dx.doi.org/10.1103/PhysRevD.105.072008

Decay modes	TAUOLA-CLEO
$\tau \to e\nu_e\,\nu_\tau$, $\tau \to \mu\nu_\mu\,\nu_\tau$	17.8 % 17.4 %
$\tau \to h^{\pm} neutr.\nu_\tau$ (single-prong)	49.5 %
$\tau \to \pi^{\pm}\nu_\tau$	11.1 %
$\tau \to \pi^0\pi^{\pm}\nu_\tau$ $\tau \to \pi^0\pi^0\pi^{\pm}\nu_\tau$ $\tau \to \pi^0\pi^0\pi^0\pi^{\pm}\nu_\tau$	25.4 % 9.2 % 1.1 %
$\tau \to K^{\pm} neutr.\nu_\tau$	1.6 %
$\tau \to h^{\pm}h^{\pm}h^{\pm} neutr.\nu_\tau$ (three-prong)	14.6 %
$\tau \to \pi^{\pm}\pi^{\pm}\pi^{\pm}\nu_\tau$ $\tau \to \pi^0\pi^{\pm}\pi^{\pm}\pi^{\pm}\nu_\tau$ $\tau \to \pi^0\pi^0\pi^{\pm}\pi^{\pm}\pi^{\pm}\nu_\tau$ $\tau \to \pi^0\pi^0\pi^0\pi^{\pm}\pi^{\pm}\pi^{\pm}\nu_\tau$	9.0 % 4.3 % 0.5 % 0.1 %
$\tau \to K^0_S X^{\pm}\nu_\tau$	0.9 %
$\tau \to (\pi^0)\pi^{\pm}\pi^{\pm}\pi^{\pm}\pi^{\pm}\pi^{\pm}\nu_\tau$ (five-prong)	0.1 %
other modes with K	1.3 %
others	0.03 %

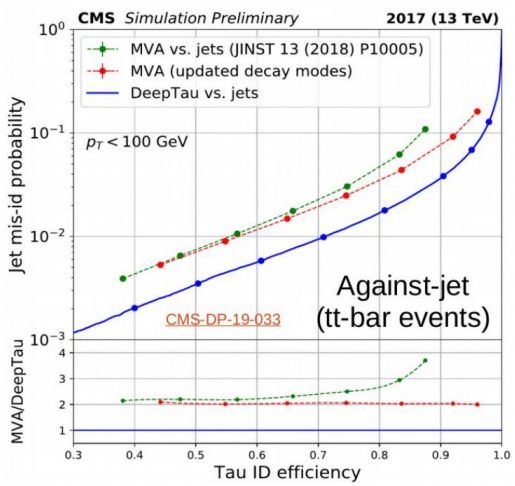
$$R_{\tau/\mu}:\ \mathcal{B}(\mathrm{W}\to\tau\overline{\nu}_\tau)\,/\,\mathcal{B}(\mathrm{W}\to\mu\overline{\nu}_\mu)$$

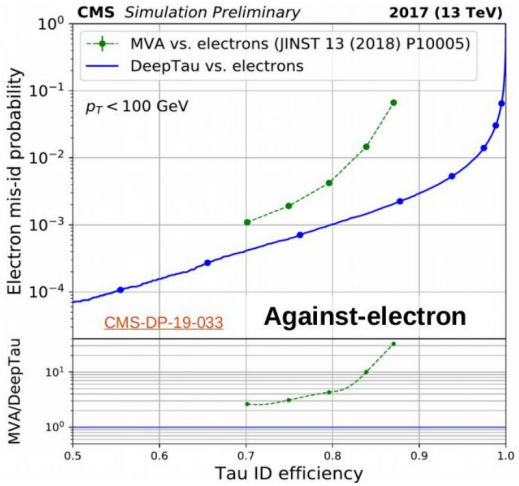
	CMS	LEP	ATLAS
$R_{\tau/\mu}$	0.985 ± 0.020	1.070 ± 0.026	0.992 ± 0.013

Exploit Run2 data **CMS** advancements in particles identification techniques to use main decay channel of the tau lepton thanks to….

Tools

…. the **DeepTau** Deep Neural Network to separate hadronically decaying τ from e, mu, jets and …





… a smart observable definition through a **double ratio**:

$$R_{\tau/\mu} = \frac{N(t\bar{t} \rightarrow b\bar{b}\tau_h e\nu\nu)}{N(t\bar{t} \rightarrow b\bar{b}\mu e\nu\nu)} \cdot \frac{N(DY \rightarrow \mu\mu)}{N(DY \rightarrow \tau_h \tau_\mu)}$$

Leading uncertainties are lepton systematics:

- ➢ Use DY normalization channel to have same leptons at numerator and denominator
- ➢ Same kinematic selections to improve uncertainty reduction
- ➢ Working on GNN to improve selection and get higher statistics and purity versus backgrounds (Single top, W+Jets, non-prompt leptons)

Preliminar estimations seem to be very encouraging and allow a precision measurement to test the SM

Water Cherenkov Test Experiment (WCTE) and Hyper-Kamiokande (HK) Calibration Sources

D. Costas-Rodríguez[1], J. A. Hernando-Morata[1], J. Renner[1]

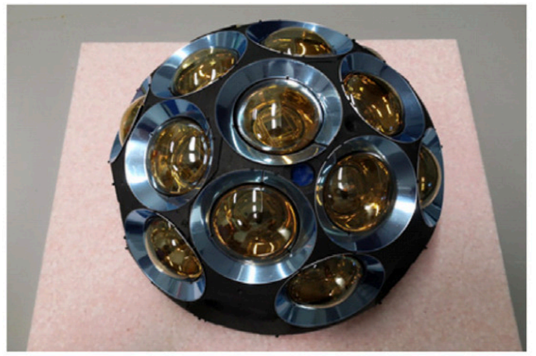
[1]IGFAE / Universidade de Santiago de Compostela

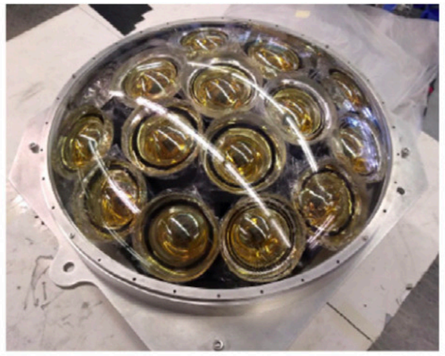
IDPASC Summer School, 18/09/2023

Objectives

- Design, simulation, development and testing of the WCTE calibration sources that will be used in HK too.

- Neutron Source particle reconstruction for particle identification using deep NNs.

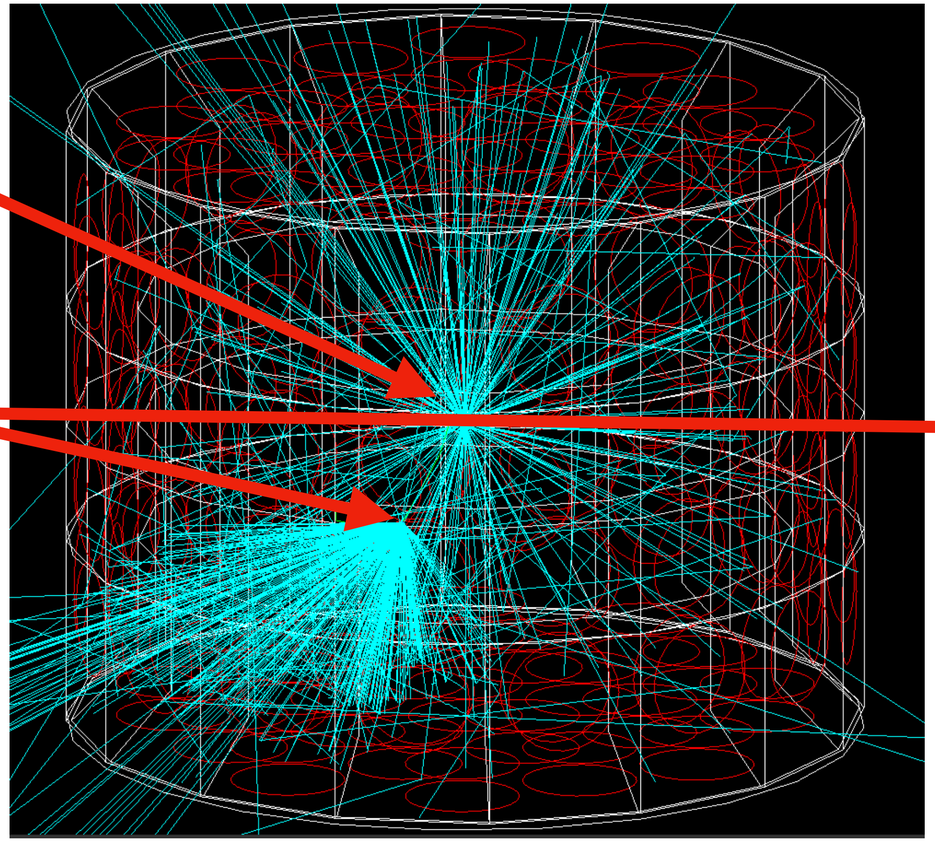


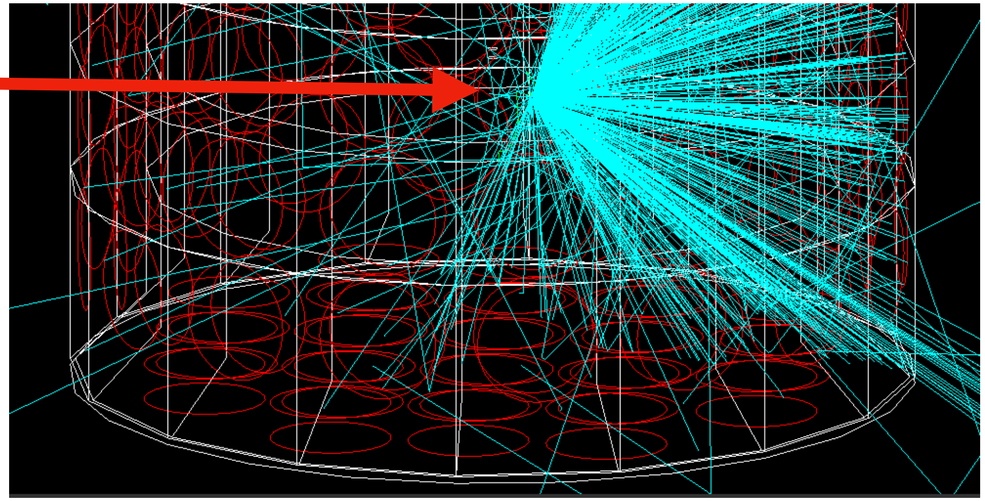


- Machining of methacrylate bar, carried out by **Iñigo Alkorta et al.** (Fabrikazio Mekanikoko mintegia, Izarraitz Lanbide Heziketa)

Scintillation: At (0,0,0) (the BGO) and 4pi direction

Cherenkov from n-capture gamma: Far from center (in the UPW) and cone-like direction





Fuensanta Vilches Bravo (Fuen)

ABOUT ME

- Born in Caravaca de la Cruz, Murcia (Spain)
- Physics Graduate, Universidad de Granada
- Future work: Quantum Field Theory
- Interests: Cat Stevens, Eric Clapton, Carole King

Luis Gil Martín

💃 Born and raised in **Sevilla, Andalucía**

📖 **Physics graduate** (Univ. de Granada)
Masters in Physics student (Univ. de Granada)

⚛️ Recently started as a **PhD student in Th. Part. Physics**
(QFT, finite temperature, phase transitions)

🍜 **Things I love:**
Eastern Asian cuisine, making silly faces at dogs, showing people around the city ☺

Things I hate:
Troubleshooting computers, summer in Sevilla

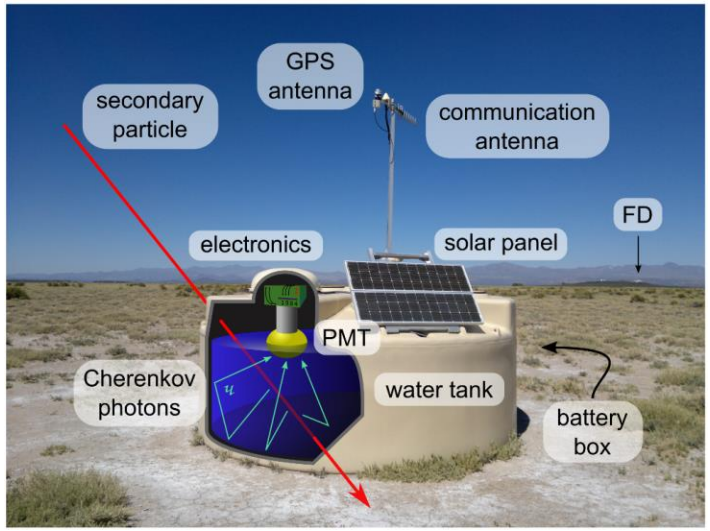
ČVUT
ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE

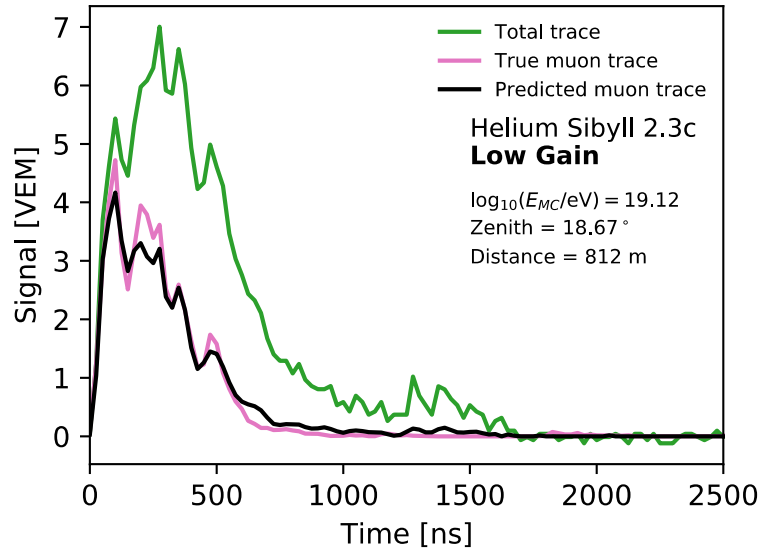
FZU Institute of Physics of the Czech Academy of Sciences

PIERRE AUGER OBSERVATORY

Margita Majerčáková

- PhD student at the Czech Technical University in Prague
- Supervisor: Dr. Alexey Yushkov, FZU
- **Topic: Extraction of the muon signals recorded by the Surface Detector of the Pierre Auger Observatory using Neural Networks (Recurrent Neural Networks)**





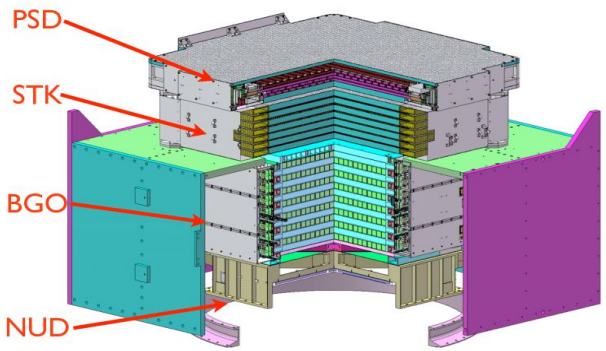
- Luis Pelegrina Gutiérrez
- Jaén, Spain
- Currently working as part of SBND collaboration and High Energy Theory Group in Granada
- Experimentalist:
  - Analysis tools and reconstruction:
    - HNL searches in SBND
    - Cross-section measurements
  - Simulation:
    - BSM simulations in SBND
  - Hardware:
    - Light measurements

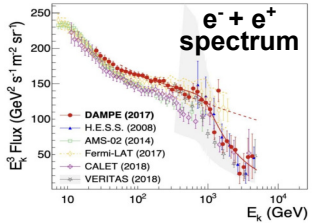
Study of galactic cosmic rays with space based missions

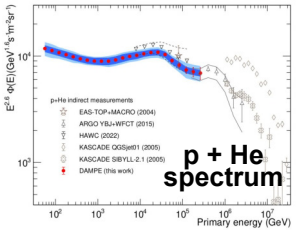
12th IDPASC school, Granada, 18th Sept. 2023

Irene Cagnoli, Gran Sasso Science Institute (GSSI)

DAMPE - CR data analysis

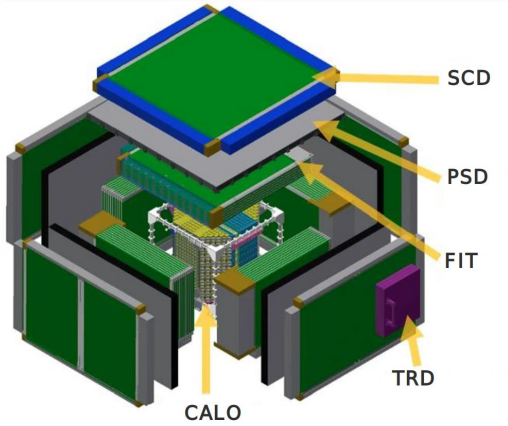






- Launched on Dec 2015
- The primary scientific goals:
  - Study of cosmic (e+ +e-) spectrum
  - Study of CR protons and nuclei
  - High energy gamma-ray astronomy
  - Indirect search for dark matter signatures
- Detection
  - e/γ: 10 GeV -10 TeV
  - Nuclei: 50 GeV - hundreds TeV
- My project data analysis
  - The all-particle energy spectrum
  - Spectral measurements of nuclei

HERD - PSD R&D and hardware tests



- Planned launch in 2027
- Scientific goals:
  - Direct measurement of Cosmic Ray energy spectrum up to the knee region (PeV scale)
  - Electron energy spectrum up to 10 TeV
  - Gamma monitor and full sky survey up to 100 TeV
  - Indirect dark matter searches
- GSSI activities are focused on the PSD R&D, for the simulation and the hardware

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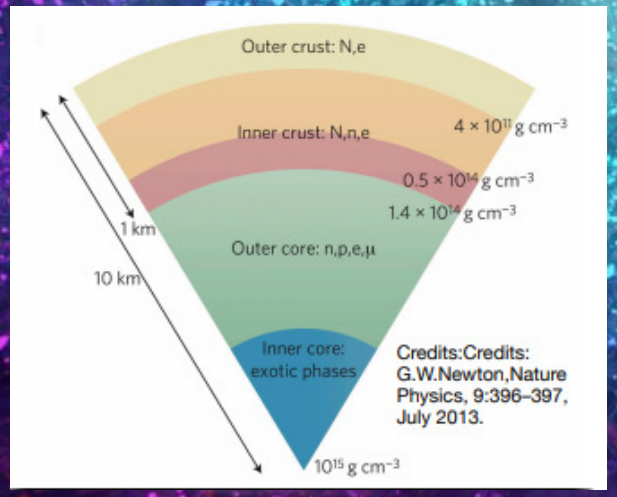
UNIVERSIDADE D COIMBRA

Helena Pais

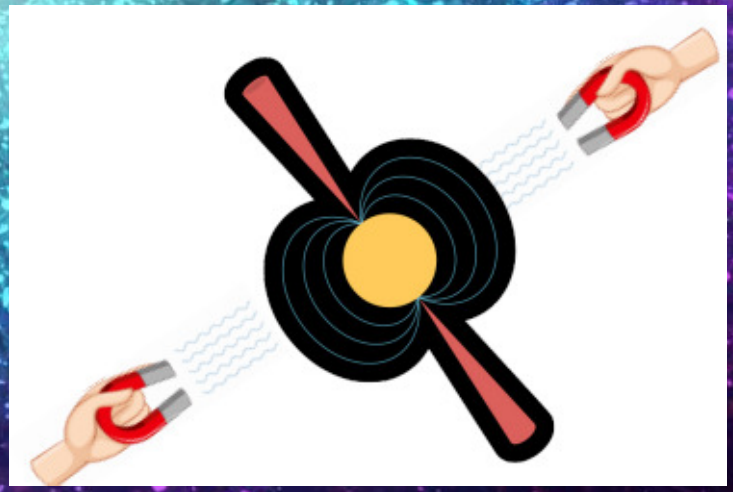
lpc caen

Francesca Gulminelli



Neutron Star Interior Composition (EoS)

Pasta Phases in Neutron Star Inner Crust



Magnetic Field effect on Interior Composition

Javier López Miras

This image has been taken in a beach in Almería, my home town.

- Bachelor's degree in Physics in University of Granada
- First year of research for the PhD in University of Granada
- Future work in Quantum Field Theory and Effective Field Theories
- Other interests: Any sport involving balls

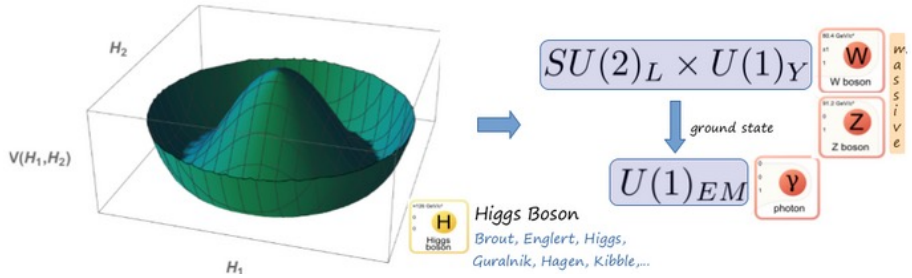
CFTC Centro de Física Teórica e Computacional
Ciências ULisboa
IDPASC
FTAE High Energy Theory
@cftc.fcul @cftc.fcul
João Viana

Gravitational Waves and Baryogenesis from a 1st order EW phase transition

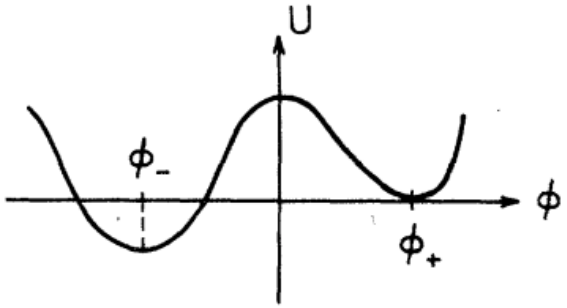
Sakharov conditions

- Baryon number violation
- C and CP violation
- Departure from equilibrium

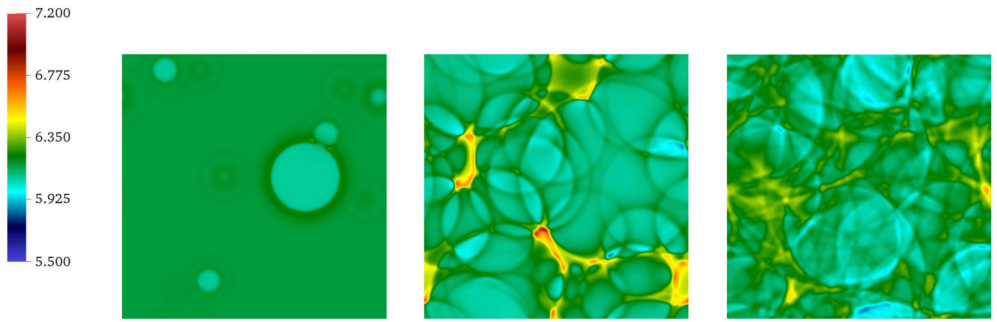
Electroweak phase transitions is a source for B-violation and out of equilibrium processes…



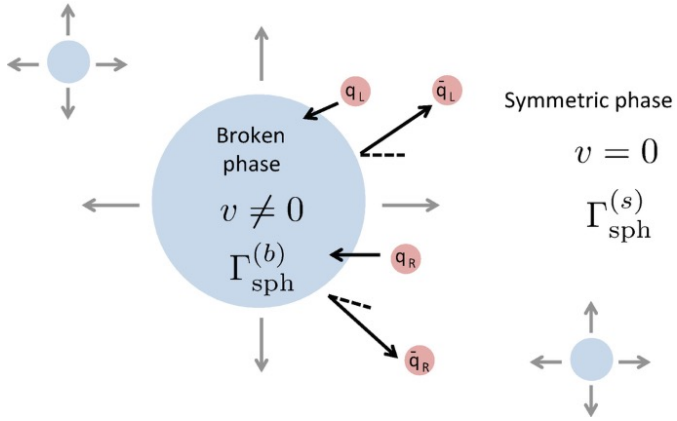
…if we have a strong 1st order EW phase transition



Gravitational Waves produced sound waves



Baryogenesis



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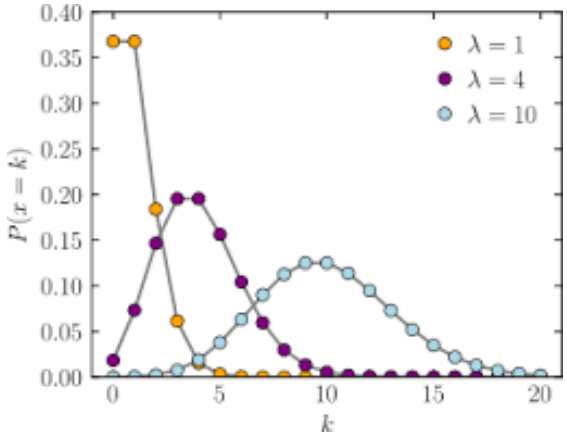
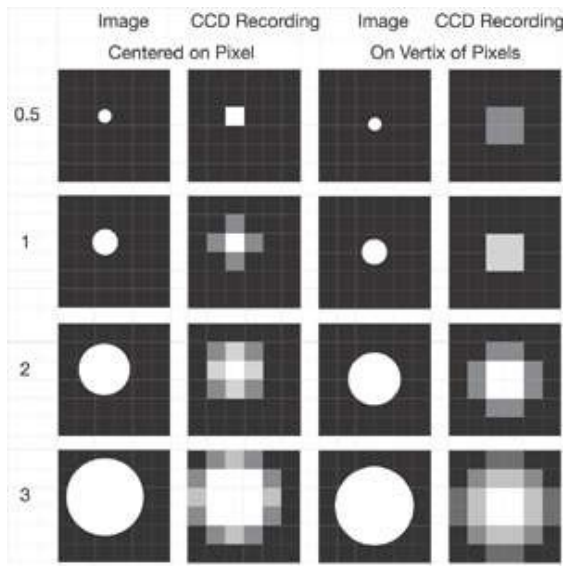
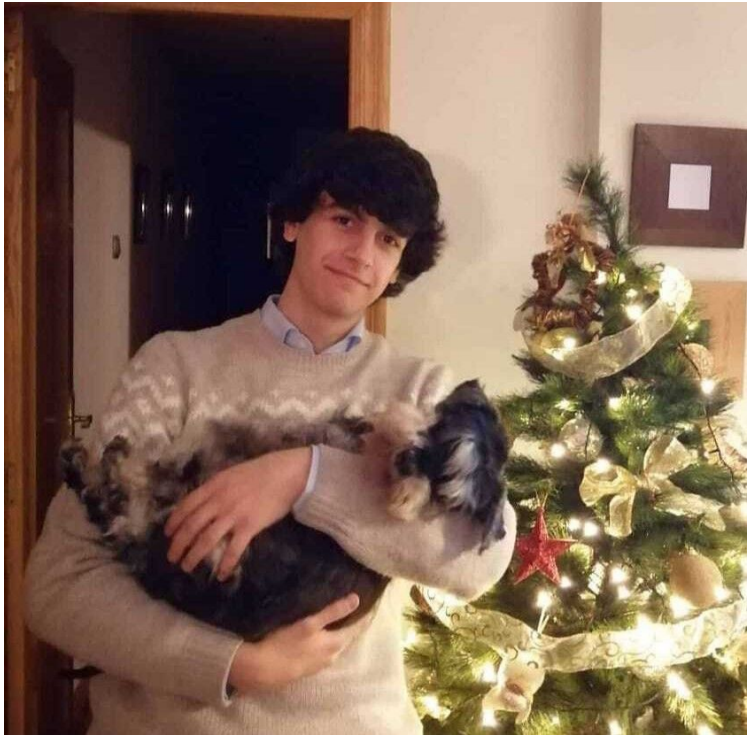
UNIÃO EUROPEIA Fundos Europeus Estruturais e de Investimento

We acknowledge financial support from the Portuguese Foundation for Science and Technology (FCT) under Contracts no. UIDB/00618/2020, UIDP/00618/2020, PRT/BD/154191/2022 and CERN/FIS-PAR/0025/2021.

- Name: Pablo Estévez Alonso
- Affiliation: Reasearcher at Experimental Neutrino Group (νUGr) & doctorate student
- Optics simulation: trigger
- Experimental optics: sensor efficiencies and improvement of light detection
- Beyond my job/studies: economy, investments, some fields of sociology and complexity of many physical systems.







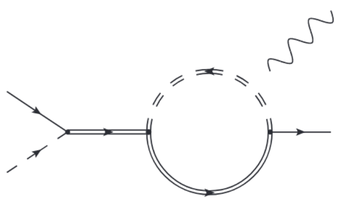
- Alejandro (or Álex, as you prefer)

- 2nd year PhD student @ University of Granada
- Working on light detection R&D (hardware and software) for neutrinos LArTPCs.
- Other interests: cooking and singing.

IDPASC school

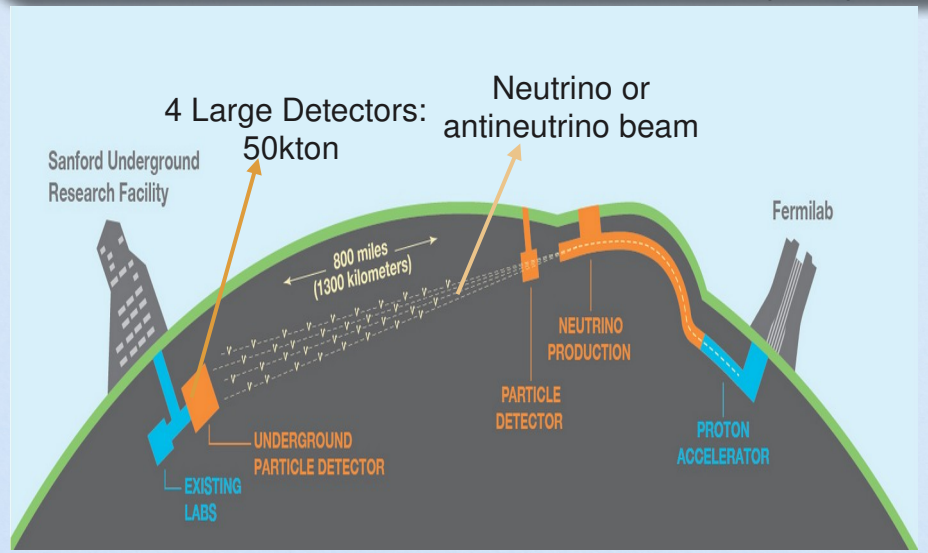
Pablo Olgoso

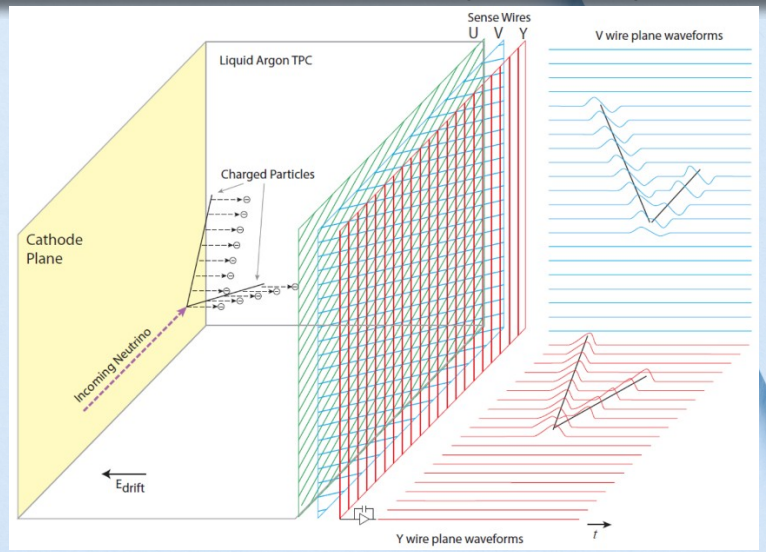
- Bachelor, masters and PhD in Granada. 🇪🇸
- Thesis defense in one week!! 🥲
- Postdoc in Padova, Italy. ✈️ 🇮🇹
- My research is focused on **EFTs**: automatic one-loop matching, dictionaries, some model building… Ask me if you're interested!! 😊

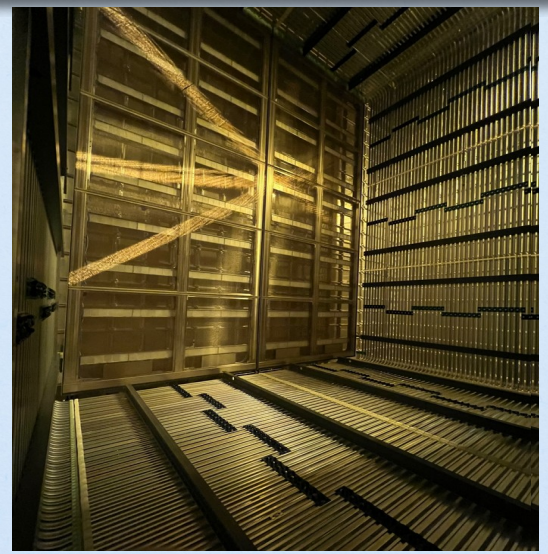


Characterization of liquid argon detectors for next generation neutrino physics

Wallison Campanelli (LIP/FCUL)
Advisors: Dr. José Maneira (LIP), Prof. Dr. Fernando Barão (IST/LIP)Dr. Francesco Pietropaolo (CERN)







Scheme Horizontal Drift LAr-TPC

ProtoDUNE LAr-TPC

Goals:

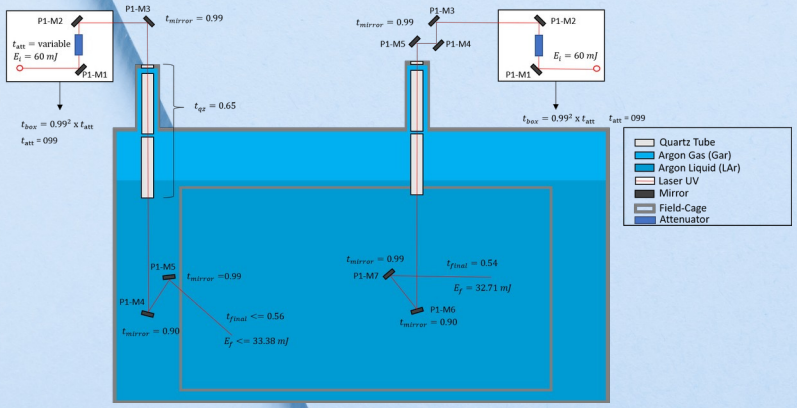
- Neutrino oscillations: CP-violation (matter/antimatter asymmetry) and Neutrino mass ordering,
- Search for nucleon decay
- Observe neutrinos from supernovae

Experimental methods

- Intense UV laser beams
- Radioactive source
- Cosmic ray muons.

Measuring charge and position we expected to obtain:

- Electric-Field, attenuation, argon purity.



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