

# Miguel Reis Orcinha

# Physicist

CONTACT INFORMATION	Dipartimento di Fisica e Geologia Università degli Studi di Perugia Via Alessandro Pascoli s.n.c. 5th floor, Office 14 I-06123 Perugia PG, Italia (Italy)	<b>Website</b> <a href="https://miguelorcinha.github.io">https://miguelorcinha.github.io</a> <b>E-mail</b> miguel.reis.orcinha@cern.ch <b>iNSPIREHEP</b> M.Orcinha.1 <b>ORCID</b> 0000-0003-1874-2144 <b>CIENCIAVITAE</b> E51C-249E-6C2E
CURRENT POSITION	<b>Researcher at Università degli Studi di Perugia - UniPG &amp; Istituto Nazionale di Fisica Nucleare - INFN, Perugia, Italy.</b>	
EDUCATION	<b>Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal</b>	
	<b>Ph.D. in Physics</b>	<b>Feb 2023</b>
	Thesis title: <i>Study of solar modulation effects on cosmic ray fluxes measured by the AMS experiment</i>	
	Supervisor: Fernando José de Carvalho Barão	
	Classification: Pass with Distinction	
	<b>M.Sc. in Engineering Physics</b>	<b>Nov 2014</b>
	Specialization: Physics	
	Thesis title: <i>Solar modulation studies and proton-electron separation with the AMS/RICH detector</i>	
	Supervisor: Fernando José de Carvalho Barão	
	Co-Supervisor: Maria Luísa Ferreira da Gama Velho Arruda	
	<b>B.Sc. in Engineering Physics</b>	<b>Sep 2011</b>
TEACHING EXPERIENCE	<b>Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal</b>	
	<b>Computational Physics</b>	
	Laboratory classes for <i>B.Sc. in Physics Engineering</i> :	
	<b>Feb 2022 - Jul 2022</b> as a Teaching Assistant	
	<b>Sep 2021 - Feb 2022</b> as a Teaching Assistant	
	<b>Sep 2020 - Mar 2021</b> as a Teaching Assistant	
	<b>Sep 2018 - Feb 2019</b> as a Teaching Collaborator	
	<b>Sep 2016 - Feb 2017</b> as a Teaching Collaborator	
	<b>Sep 2015 - Feb 2016</b> as a Teaching Collaborator	
	<b>Electromagnetism and Optics</b>	
	Problem classes for <i>B.Sc. in Industrial Management and Engineering &amp; B.Sc. in Telecommunications and Informatics Engineering</i> :	
	<b>Sep 2020 - Mar 2021</b> as a Teaching Assistant	
	Laboratory classes for <i>Bologna B.Sc. Biomedics Engineering &amp; Bologna B.Sc. Applied Mathematics to Computers</i> :	
	<b>Sep 2020 - Mar 2021</b> as a Teaching Collaborator	
	<b>Laboratory of Radiation and Atomic Physics - LFRA</b>	
	Laboratory classes for <i>B.Sc. Physics Engineering</i> :	
	<b>Sep 2017 - Feb 2018</b> as a Teaching Collaborator	
	<b>Laboratory of Advanced Experimental Physics - LFEA</b>	
	Laboratory classes for <i>B.Sc. Physics Engineering</i> :	
	<b>May 2021</b> preparation and guidance of "Cosmic Ray Lab - LIP" set of experiments	
	<b>May 2019</b> preparation and guidance of "Cosmic Ray Lab - LIP" set of experiments	
	<b>May 2018</b> preparation and guidance of "Cosmic Ray Lab - LIP" set of experiments	
	<b>May 2017</b> preparation and guidance of "Cosmic Ray Lab - LIP" set of experiments	
	<b>May 2016</b> preparation and guidance of "Cosmic Ray Lab - LIP" set of experiments	

**Faculdade de Ciências, Universidade de Lisboa, Lisbon, Portugal****Advanced Formation of Teachers**

“VI Encontro Internacional da Casa Das Ciências - VI International Meeting of the House of Sciences”:

**12 Jul 2019** Preparation of activities and guidance of attendees for the “VI Encontro Internacional da Casa Das Ciências - VI International Meeting of the House of Sciences” on the topic of “Experimentação com sensores, Raspberry Pis e programação Python - Experimenting with sensors, Raspberry Pi’s and Python programming” for basic (7th-9th year) and high school teachers.

**Tutoring****Private lessons****Nov 2019 - Feb 2023**

Students spanned over secondary, undergraduate, graduate, master’s and doctoral levels.

**Statistics** for Scientific and Engineering degrees, Statistics applied to Finance, Statistics applied to Social Sciences, Topics of Statistical Inference

**Econometrics**

**Physics** for Scientific and Engineering degrees

**Mathematics** Calculus, Algebra

**Time Series Analysis**

**Data Analysis** coded in Python, C++, included Machine Learning

**Web Scraping** coded in Python & C++

**Programming** in C, C++ & Python

**SUPERVISION  
EXPERIENCE****Università degli Studi di Perugia - UniPG, Perugia, Italy**

**Nov 2023 - present** - “Studio della variabilità dei raggi cosmici a varie scale temporali”, Margherita Fioroni,

*Laurea Magistrale in Fisica* (M.Sc. in Physics)

Role: Co-Supervisor

**Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal**

**Feb 2023 - Jul 2023** - “Time Variability of Cosmic Ray Fluxes”, Rafael Parente,

1st Cycle Integrated Project in Engineering Physics - Bologna B.Sc. in Engineering Physics

Role: Co-Supervisor

**LIP Internship Program**

**Jul 2022 - Oct 2022** - “Temporal variability of the cosmic-ray flux”

**Jul 2019 - Sep 2019** - “Selection of Helium nuclei using multivariate data analysis in AMS”

**Jul 2018 - Sep 2018** - “Solar modulation of cosmic rays - 1D Stochastic resolution”

**Jul 2017 - Sep 2017** - “Solar modulation of cosmic rays - 1D Finite Difference”

**Jul 2016 - Sep 2016** - “Selection of positrons in AMS and measurement of its differential rate (dN/dt.dRig)”

**FELLOWSHIPS,  
SCHOLARSHIPS  
& AWARDS****Assegno di Ricerca (Scientific Research Grant)****Apr 2023 - present**

Title: “Studio fenomenologico della modulazione solare dei raggi cosmici galattici”

Funding: Dipartimento di Fisica e Geologia, Università degli Studi di Perugia, Perugia, Italy, D.R. 3437 del 13.12.2022

**Ph.D. Grant****Mar 2015 - Mar 2019**

Study of solar modulation effects on cosmic ray fluxes measured by the AMS experiment

Funding: FCT - Fundação para a Ciência e Tecnologia, Portugal, ref. SFRH/BD/104462/2014.

**Diploma for Teaching Excellence**

**2021/2022** - Computational Physics - Instituto Superior Técnico, Portugal

**2020/2021** - Computational Physics - Instituto Superior Técnico, Portugal

**2018/2019** - Computational Physics - Instituto Superior Técnico, Portugal

**2016/2017** - Computational Physics - Instituto Superior Técnico, Portugal

**2015/2016** - Computational Physics - Instituto Superior Técnico, Portugal

REFEREED  
JOURNAL  
PUBLICATIONS

The following papers were published in the following international peer-reviewed journals: **Physical Review Letters**, **Advances in Space Research** and **The Astrophysical Journal Letters**, with article [8] featured as a highlight on the AAS NOVA editor's choice. A complete reference list of the publications can be found on the INSPIRE database [here](#).

28. M. Aguilar et al. (AMS Collaboration), "Temporal Structures in Positron Spectra and Charge-Sign Effects in Galactic Cosmic Rays", *Phys. Rev. Lett.* 131 (2023) 151002, doi: 10.1103/PhysRevLett.131.151002
27. M. Aguilar et al. (AMS Collaboration), "Properties of Cosmic-Ray Sulfur and Determination of the Composition of Primary Cosmic-Ray Carbon, Neon, Magnesium, and Sulfur: Ten-Year Results from the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 130 (2023) 211002, doi: 10.1103/PhysRevLett.130.211002
26. M. Aguilar et al. (AMS Collaboration), "Temporal Structures in Electron Spectra and Charge Sign Effects in Galactic Cosmic Rays", *Phys. Rev. Lett.* 130 (2023) 161001, doi: 10.1103/PhysRevLett.130.161001
25. M. Aguilar et al. (AMS Collaboration), "Properties of Daily Helium Fluxes", *Phys. Rev. Lett.* 128 (2022) 231102, doi: 10.1103/PhysRevLett.128.231102
24. M. Aguilar et al. (AMS Collaboration), "Periodicities in the Daily Proton Fluxes from 2011 to 2019 Measured by the Alpha Magnetic Spectrometer on the International Space Station from 1 to 100 GV", *Phys. Rev. Lett.* 127 (2021) 271102, doi: 10.1103/PhysRevLett.127.271102
23. M. Aguilar et al. (AMS Collaboration), "Properties of a New Group of Cosmic Nuclei: Results from the Alpha Magnetic Spectrometer on Sodium, Aluminum, and Nitrogen", *Phys. Rev. Lett.* 127 (2021) 021101, doi: 10.1103/PhysRevLett.127.021101
22. M. Aguilar et al. (AMS Collaboration), "Properties of Heavy Secondary Fluorine Cosmic Rays: Results from the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 126 (2021) 081102, doi: 10.1103/PhysRevLett.126.081102
21. M. Aguilar et al. (AMS Collaboration), "Properties of Iron Primary Cosmic Rays: Results from the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 126 (2021) 041104, doi: 10.1103/PhysRevLett.126.041104
20. M. Aguilar et al. (AMS Collaboration), "The Alpha Magnetic Spectrometer (AMS) on the international space station: Part II – Results from the first seven years", *Phys. Rept.* 894 (2020) 1-116, doi: 10.1016/j.physrep.2020.09.003
19. M. Aguilar et. al. (AMS Collaboration), "Properties of Neon, Magnesium, and Silicon Primary Cosmic Rays Results from the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 124 (2020) 211102, doi: 10.1103/PhysRevLett.124.211102
18. M. Aguilar et. al. (AMS Collaboration), "Properties of Cosmic Helium Isotopes Measured by the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 123 (2019) 181102, doi: 10.1103/PhysRevLett.123.181102
17. N. Tomassetti, F. Barao, B. Bertucci, E. Fiandrini, M. Orcinha, "Numerical modeling of cosmic-ray transport in the heliosphere and interpretation of proton and helium fluxes in Solar Cycle 24", *Advances in Space Research* 64 (2019) 2477-2489, doi: 10.1016/j.asr.2019.06.025
16. M. Aguilar et. al. (AMS Collaboration), "Towards Understanding the Origin of Cosmic-Ray Electrons", *Phys. Rev. Lett.* 122 (2019) 101101, doi: 10.1103/PhysRevLett.122.101101
15. M. Aguilar et. al. (AMS Collaboration), "Towards Understanding the Origin of Cosmic-Ray Positrons", *Phys. Rev. Lett.* 122 (2019) 041102, doi: 10.1103/PhysRevLett.122.041102
14. N. Tomassetti, F. Barao, B. Bertucci, E. Fiandrini, J. L. Figueiredo, J. B. Lousada, M. Orcinha, "Testing Diffusion of Cosmic Rays in the Heliosphere with Proton and Helium Data from AMS", *Phys. Rev. Lett.* 121 (2018) 251104, doi: 10.1103/PhysRevLett.121.251104

13. M. Aguilar et. al. (AMS Collaboration), "Precision Measurement of Cosmic-Ray Nitrogen and its Primary and Secondary Components with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 121 (2018) 051103, doi: 10.1103/PhysRevLett.121.051103
12. M. Aguilar et. al. (AMS Collaboration), "Observation of Complex Time Structures in the Cosmic-Ray Electron and Positron Fluxes with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 121 (2018) 051102, doi: 10.1103/PhysRevLett.121.051102
11. M. Aguilar et. al. (AMS Collaboration), "Observation of Fine Time Structures in the Cosmic Proton and Helium Fluxes with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 121 (2018) 051101, doi: 10.1103/PhysRevLett.121.051101
10. M. Aguilar et. al. (AMS Collaboration), "Observation of New Properties of Secondary Cosmic Rays Lithium, Beryllium, and Boron by the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 120 (2018) 021101, doi: 10.1103/PhysRevLett.120.021101
9. M. Aguilar et. al. (AMS Collaboration), "Observation of the Identical Rigidity Dependence of He, C, and O Cosmic Rays at High Rigidities by the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 120 (2017) 021101, doi: 10.1103/PhysRevLett.119.251101
8. N. Tomassetti, M. Orcinha, F. Barao, B. Bertucci, "Evidence for a Time Lag in Solar modulation of galactic cosmic rays", *ApJL*, 849 (2017) L32, doi: 10.3847/2041-8213/aa9373
7. M. Aguilar et. al. (AMS Collaboration), "Precision Measurement of the Boron to Carbon Flux Ratio in Cosmic Rays from 1.9 GV to 2.6 TV with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 117 (2016) 231102, doi: 10.1103/PhysRevLett.117.231102
6. M. Aguilar et al. (AMS Collaboration), "Antiproton Flux, Antiproton-to-Proton Flux Ratio, and Properties of Elementary Particle Fluxes in Primary Cosmic Rays Measured with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 117 (2016) 091103, doi: 10.1103/PhysRevLett.117.091103
5. M. Aguilar et al. (AMS Collaboration), "Precision Measurement of the Helium Flux in Primary Cosmic Rays of Rigidities 1.9 GV to 3 TV with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 115 (2015) 211101, doi: 10.1103/PhysRevLett.115.211101
4. M. Aguilar et al. (AMS Collaboration), "Precision Measurement of the Proton Flux in Primary Cosmic Rays from Rigidity 1 GV to 1.8 TV with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 114 (2015) 171103, doi: 10.1103/PhysRevLett.114.171103
3. L. Accardo et al. (AMS Collaboration), "High Statistics Measurement of the Positron Fraction in Primary Cosmic Rays of 0.5-500 GeV with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.* 113 (2014) 121101, doi: 10.1103/PhysRevLett.113.121101
2. M. Aguilar et al. (AMS Collaboration), "Electron and Positron Fluxes in Primary Cosmic Rays Measured with the Alpha Magnetic Spectrometer on the International Space Station", *Phys. Rev. Lett.*, 113 (2014) 121102, doi: 10.1103/PhysRevLett.113.121102
1. M. Aguilar et al. (AMS Collaboration), "Precision Measurement of the (e++e-) Flux in Primary Cosmic Rays from 0.5 GeV to 1 TeV with the Alpha Magnetic Spectrometer on the International Space Station", *Phys.Rev.Lett.* 113 (2014) 221102, doi: 10.1103/PhysRevLett.113.221102

CONFERENCE  
PROCEEDINGS

1. M. Orcinha, N. Tomassetti, F. Barão and B. Bertucci, "Observation of a time lag in solar modulation of cosmic rays in the heliosphere", *J. Phys.: Conf. Ser.* 1181 (2019) 1, 012013, doi: 10.1088/1742-6596/1181/1/012013  
26th Extended European Cosmic Ray Symposium and 35th Russian Cosmic Ray Conference, Barnaul - Belokurikha - Altai Mountains, Russia, July 6 - 10, (2018)

CONFERENCE  
& WORKSHOP  
PRESENTATIONS

**Contributed talks at international conferences and workshops**

**7 July 2018** "Observation of a time lag in solar modulation of cosmic rays in the heliosphere", 26th Extended European Cosmic Ray Symposium and 35th Russian Cosmic Ray Conference, Altai State University, Barnaul & Belokurikha, Russia

**Contributed talks at national conferences and workshops**

**2 Jul 2019** "Study of solar modulation effects on cosmic ray fluxes measured by the AMS experiment", 5th IDPASC/LIP Students Workshop, University of Minho, Braga, Portugal

**17 Feb 2018** "AMS - Solar modulation in the AMS era", "Jornadas do LIP" - LIP National Workshop, Évora, Portugal

**24 Mar 2017** "Solar modulation of the galactic cosmic-ray flux", LIP PhD Student's workshop, University of Coimbra, Coimbra, Portugal

**20 Oct 2015** "Short-term structures in the AMS-02 proton flux", IDPASC Workshop on "Space Particles and Earth", University of Évora, Évora, Portugal

**Scientific Collaboration Talks**

**12 Oct 2023** "GCRs long term variations", M. Orcinha (on behalf of Bruna Bertucci), for CAESAR project general meeting, Perugia, Italy

**1 Mar 2018** "Solar Modulation Studies with Protons", M. Orcinha, F. Barão, L. Derome, N. Tomassetti, for AMS Collaboration General Analysis Meeting - Low Energy, Geneva, Switzerland

**Poster sessions**

**6 July 2018** "Precision Measurement of the Monthly Cosmic Ray Fluxes with the Alpha Magnetic Spectrometer on the ISS", 26th Extended European Cosmic Ray Symposium and 35th Russian Cosmic Ray Conference, Altai State University, Barnaul & Belokurikha, Russia

**12 October 2017** "Solar Modulation of Galactic Cosmic-Rays", Técnico Lisboa Research Activity during the Top Industrial Managers Europe General Assembly, Instituto Superior Técnico, Lisboa, Portugal

**5-6 April 2017** "Solar Modulation of Galactic Cosmic-Rays", IST PhD OpenDays, Instituto Superior Técnico, Lisboa, Portugal

ADVANCED  
EDUCATION

**Participation in international schools**

**Sep 2015** "3rd International Summer School on INtelligent Signal Processing for FrontIER Research and Industry - INFIERI", University of Hamburg and Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany

KNOWLEDGE  
TRANSFER

**Invited talks at academic institutions**

**20 Dec 2018** "Parallelization of Code in Physics - An introduction to Parallelization & MPI", Seminar for the course of "Computational Physics", taught by Fernando Barão, for the MSc in Physics Engineering of Instituto Superior Técnico, Instituto Superior Técnico, Lisboa, Portugal

**14 Dec 2018** "Parallel Selection of Protons in AMS - Optimizing data selection with Open MPI", Seminar for the course of "Programming for Cluster and Multicore", taught by Alcides Fonseca, for the MSc in Computer Science of the Faculty of Sciences of the University of Lisbon, Faculdade de Ciências da Universidade de Lisboa, Lisboa Portugal

**12 Jul 2017** "A experiência AMS - Efeito do vento Solar", IDPASC Workshop "Hands on Particles and Light", Instituto Superior Técnico, Lisboa, Portugal

**14 Jul 2016** "Introdução a ROOT", IDPASC Workshop "Hands on Particles and Light", Instituto Superior Técnico, Lisboa, Portugal

**15 Jul 2016** "A experiência AMS - Efeito do vento Solar", IDPASC Workshop "Hands on Particles and Light", Instituto Superior Técnico, Lisboa, Portugal

**29 Mar 2016** “Overview of the Solar Modulation Phenomenon”, Laboratoire de Physique Subatomique et de Cosmologie - CNRS, Grenoble, France

#### Outreach initiatives

**20 Nov 2023** Participation on “International Cosmic Day” (ICD-2023), organized by INFN-Perugia and Dept. of Physics & Geology of Università degli Studi di Perugia - UniPG, Perugia, Italy. Nationally coordinated by the network OCRA - Outreach Cosmic Ray Activities

**30 Sep 2023** Participation on “Particelle nella Nebbia”, made for SHARPER - the EU’s Researcher’s Night 2023, organized by INFN and Dept. of Physics & Geology of Università degli Studi di Perugia - UniPG, Perugia, Italy

**13 May 2022** Presented the lecture entitled “Alpha Magnetic Spectrometer - A cosmic-ray observatory in space” for the *Seventh Lisbon mini-school on Particle and Astroparticle Physics*, Oeiras, Portugal

**9 Mar 2022** Presented the lecture entitled “Alpha Magnetic Spectrometer - A cosmic-ray observatory in space” for the *Jornadas da Engenharia Física do Técnico - Inside Views*, LIP - Lisboa, Portugal

**7 Feb 2020** Presented the lecture entitled “Alpha Magnetic Spectrometer - A cosmic-ray observatory in space” for the *Fifth Lisbon mini-school on Particle and Astroparticle Physics*, Costa da Caparica, Portugal

**9 May 2018** Presented the lecture entitled “LIP - Das profundezas da terra ao espaço (The AMS Experiment)” for the *32º aniversário do LIP*, Laboratório de Instrumentação e Física Experimental de Partículas, Lisboa, Portugal

**22 Nov 2017** Presented the lecture entitled “A Escuridão do Espaço - Matéria Escura e AMS” for the *A Semana da Ciência e Tecnologia no LIP*, Laboratório de Instrumentação e Física Experimental de Partículas, Lisboa, Portugal

#### SCIENTIFIC PROJECTS

##### CAESAR

**Apr 2023 - present**

Title: CAESAR - Comprehensive spAce wEather Studies for the ASPIS prototype Realization

Funding: INAF-ASI - Istituto Nazionale di Astrofisica, Agenzia Spaziale Italiana, Italy, ref. 2020-35-HH.0

Role: Researcher

##### AMS - Alpha Magnetic Spectrometer

**2021 - present**

Title: Collaboration in the International Space Station experiment AMS for the detection of intermediate energy cosmic rays

Funding: FCT - Fundação para a Ciência e Tecnologia, Portugal, ref. CERN/FIS-PAR/0007/2021

Role: Researcher & Ph.D. Student (formerly)

##### AMS - Alpha Magnetic Spectrometer

**2019 - 2021**

Title: Collaboration in the International Space Station experiment AMS for the detection of intermediate energy cosmic rays

Funding: FCT - Fundação para a Ciência e Tecnologia, Portugal, ref. CERN/FIS-PAR/0013/2019

Role: Ph.D. Student

##### AMS - Alpha Magnetic Spectrometer

**2017 - 2019**

Title: Collaboration in the International Space Station experiment AMS for the detection of intermediate energy cosmic rays

Funding: FCT - Fundação para a Ciência e Tecnologia, Portugal, ref. CERN/FIS-PAR/0020/2017

Role: Ph.D. Student

##### AMS - Alpha Magnetic Spectrometer

**2011 - 2014**

Title: Detection of intermediate energy cosmic rays with the AMS experiment

Funding: FCT - Fundação para a Ciência e Tecnologia, Portugal, ref. PTDC/FIS/122567/2010

Role: M.Sc. Student

#### OTHER SCIENTIFIC ACTIVITIES

#### Current Scientific positions & Memberships

**2023 - present - Associated Researcher** of the Istituto Nazionale di Fisica Nucleare - INFN, Perugia, Italy

**2023 - present - Assegnista di Ricerca** of the Università degli Studi di Perugia - UniPG, Perugia, Italy

**2013 - present - Associated Researcher** of Laboratório de Instrumentação e Física Experimental de Partículas - LIP, Lisboa, Portugal

**2013 - present - Member** of AMS - international scientific collaboration Alpha Magnetic Spectrometer

**2013 - present - Member** of CERN - the European Organization for Nuclear Research

#### Teaching positions

**2020 - 2022 - Teaching Assistant** at Instituto Superior Técnico, Lisbon, Portugal

**2015 - 2019 - Teaching Collaborator** at Instituto Superior Técnico, Lisbon, Portugal

#### Visits

**March - June 2016** Laboratoire de Physique Subatomique et de Cosmologie - LPSC, Grenoble, France

Visiting researcher under collaboration with Professor Laurent Derome.

**2013 - Present** regular yearly short-term visits to CERN, Geneva, Switzerland

#### Service

**2013 - 2019 - AMS Collaboration** - shifter for the PM sub-detector group (ECAL, TOF, RICH). RICH expert on-call from CERN area during shifts.

## PERSONAL PROJECTS

#### Electronics

**P4 September 2019** Design and development of the "ADC Stereo - Analog-to-Digital Converted Stereo", a wireless playback device (WiFi and Bluetooth) from an old Denon audio amplifier and radio receiver. It is a RaspberryPi-based system which can receive audio from AirPlay or Bluetooth and can be controlled manually through the original analog interface. The interface is digitized using an Arduino Uno which communicates with the RaspberryPi through a USB serial connection. The user can also interact with the device through the LCD display.

**P2 June 2016** Design and development of an Arduino-based control system for a graduation project of students of the Universidade de Belas Artes de Lisboa. The object consisted of an acrylic cube which would glow and change colours as people in the exhibit room got closer or farther away from it. The control system used ultrasound sensors and an Arduino to control the RGB LED strips.

**P1 May 2015 - 2019** Participated on the design of a front end circuit board for a silicon photomultiplier for the AMU ("A Observar Muões" - "Observing Muons") project at LIP. Design and layout of a 4 layer board with signal amplification and pre-amplification, analog output, variable threshold and a digital output in the TTL and NIM norms.

#### Software design

**P5 Jan 2021** Design and development of a web scrapping platform for publicly available documents from Torre do Tombo's archive website for research purposes. Main focus of the research is the Portuguese Inquisition. A database of all inquisition processes has been created which includes partial treatment of bad inputs, linking of split partial entries and some statistical analysis of data.

**P3 Jan 2017** Design and development of a parallelization algorithm with natural workload balancing for the optimization of Proton event selection from AMS cosmic ray data. It was coded in C++ using Open MPI for the parallelization scheme and used AMS libraries, custom LIP libraries (file management and XRootD access) and a selection scheme designed by me.

## HARDWARE & SOFTWARE SKILLS

### Programming & Scripting Languages

- > C, C++
- > PHP, HTML, CSS
- > Python
- > UNIX shell scripting (bash, dash, tcsh, zsh)
- > GNU Make
- > Markdown (GitHub and Emacs Muse flavours), Obsidian

### Parallelization and Communication Technologies

- > Message Passing Interface (OpenMPI implementation in C/C++ and mpi4py in Python)
- > Threads
- > Forks
- > Inter-Process Communication (Signal, Message Queue, Socket, Shared Memory, Semaphores, Mutex, Conditions, MPI, Pipe)

### Signal Processing

- > Empirical Mode Decomposition
- > Wavelet Transform
- > Fourier Transform

### Data Analysis

- > Wolfram Mathematica
- > ROOT - Data Analysis Framework, CERN
- > TMVA - Toolkit for Multivariate Data Analysis with ROOT (Boosted Decision Trees, Perceptrons, ...)
- > statsmodels
- > Numpy
- > Pandas

### Data Structures

- > ROOT files (C++ Object Oriented Storage)
- > XML
- > JSON
- > CSV (and similar)
- > SQL (MySQL)

### Access, Extraction & Management of Data

- > RAID
- > XRootD, EOS
- > CVMFS - CERN VM File System
- > NFS
- > Web Scrapping (GET & POST requests, HTML & JSON parsing)

### Web, Serial & IoT Communication Protocols

- > I<sup>2</sup>C, SPI
- > TCP, UDP, FTP, HTTP requests

### Package Management Software

- > Homebrew
- > Apt (apt-get) - Advanced Packaging Tool

### Project Management Software

- > Trello

### Virtualization Software

- > VMWare
- > VirtualBox

### Version Control Software

- > DVCS (Git) - GitHub, GitLab, Bitbucket
- > VCS (CVS, SVN)

### Text Editing and Productivity Software

- > Vim, Emacs
- > Sublime Text 4
- > Visual Studio Code
- > Atom text editor
- > TeX (T<sub>E</sub>X, L<sub>A</sub>T<sub>E</sub>X 2<sub>ε</sub>, B<sub>B</sub>T<sub>E</sub>X, TikZ, A<sub>M</sub>S-L<sub>A</sub>T<sub>E</sub>X, MiK<sub>T</sub>E<sub>X</sub>, pdfL<sub>A</sub>T<sub>E</sub>X),
- > Microsoft Office, OpenOffice.org, LibreOffice, Google Docs

### Computer-Aided Design (CAD) Software

- > Autodesk Eagle - PCB Design Software
- > Fritzing
- > Autodesk AutoCAD

### Graphic Design Tools

- > Boxy SVG
- > Sip
- > Inkscape
- > Gimp

### Operating Systems

- > Microsoft Windows family
- > Apple OSX
- > Linux

### Micro-Computers

- > Arduino
- > Raspberry Pi (2 Model A, B and B+, 3 Model B and B+)
- > BeagleBoard (BeagleBone Black)

### 3D printing

- > Creality Ender 3 V2