

Miguel Reis Orcinha

Physicist

CONTACT INFORMATION

Dipartimento di Fisica e Geologia
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CURRENT POSITION

Researcher at Università degli Studi di Perugia — UniPG & Istituto Nazionale di Fisica Nucleare — INFN, Perugia, Italy.

EDUCATION

Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal

Ph.D. in Physics

Thesis title: *Study of solar modulation effects on cosmic ray fluxes measured by the AMS experiment*
Supervisor: Fernando José de Carvalho Barão
Classification: Pass with Distinction

M.Sc. in Engineering Physics

Nov 2014

Specialization: Physics
Thesis title: *Solar modulation studies and proton-electron separation with the AMS/RICH detector*
Supervisor: Fernando José de Carvalho Barão
Co-Supervisor: Maria Luísa Ferreira da Gama Velho Arruda

B.Sc. in Engineering Physics

Sep 2011

TEACHING EXPERIENCE

Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal

Computational Physics

Laboratory classes for *B.Sc. in Physics Engineering*:
Feb 2022–Jul 2022 as a Teaching Assistant
Sep 2021–Feb 2022 as a Teaching Assistant
Sep 2020–Mar 2021 as a Teaching Assistant
Sep 2018–Feb 2019 as a Teaching Collaborator
Sep 2016–Feb 2017 as a Teaching Collaborator
Sep 2015–Feb 2016 as a Teaching Collaborator

Electromagnetism and Optics

Problem classes for *B.Sc. in Industrial Management and Engineering & B.Sc. in Telecommunications and Informatics Engineering*:

Sep 2020 — Mar 2021 as a Teaching Assistant

Laboratory classes for *B.Sc. Biomedics Engineering & B.Sc. Applied Mathematics to Computers*:

Feb 2018 — Jul 2018 as a Teaching Collaborator

Laboratory of Radiation and Atomic Physics — LFRA

Laboratory classes for *B.Sc. Physics Engineering*:

Sep 2017 — Feb 2018 as a Teaching Collaborator

Laboratory of Advanced Experimental Physics — LFEA

Laboratory classes for *B.Sc. Physics Engineering*:

May 2021 preparation and guidance of “Cosmic Ray Lab — LIP” set of experiments

May 2019 preparation and guidance of “Cosmic Ray Lab — LIP” set of experiments

May 2018 preparation and guidance of “Cosmic Ray Lab — LIP” set of experiments

May 2017 preparation and guidance of “Cosmic Ray Lab — LIP” set of experiments

May 2016 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

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

Econometrics

Physics for Scientific and Engineering degrees

SUPERVISION EXPERIENCE

Università degli Studi di Perugia — UniPG, Perugia, Italy

Nov 2023 — Apr 2024 — “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, GRANTS & AWARDS

Assegno di Ricerca (Scientific Research Grant)

Apr 2024 — present

Title: “Study of cosmic radiation”

Position: Senior Level 2 Researcher

Funding: Istituto Nazionale di Fisica Nucleare, Perugia, Italy, ref. 26050/2023. Agreement ASI-INFN 2019-19-HH.0, its amendments. No. 2021-43-HH.0.

Assegno di Ricerca (Scientific Research Grant)

Apr 2023 — Apr 2024

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

Position: Researcher

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

Scientific Research Grant

01 Apr 2021 — 31 Aug 2021

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

Position: PhD student

Funding: LIP — Laboratory of Instrumentation and Experimental Particle Physics, FCT — Fundação para a Ciência e Tecnologia, Portugal, ref. LIP/BI-05/2021, part of project CERN/FIS-PAR/0013/2019.

Ph.D. Grant

Mar 2015 — Mar 2019

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

Position: PhD student

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](#).

33. P. Väisänen et al., "Simulation of Galactic cosmic ray proton fluxes with the daily modulation potential: Validation with AMS02 data for 2011-2019", *JGR: Space Physics* (2025), (awaiting publication), doi: 10.22541/essoar.173532496.66800900/v2
32. M. Aguilar et al. (AMS Collaboration), "Properties of Cosmic Lithium Isotopes Measured by the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 134 (2025) 20, 201001, doi: 10.1103/PhysRevLett.134.201001
31. M. Aguilar et al. (AMS Collaboration), "Antiprotons and Elementary Particles over a Solar Cycle: Results from the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 134 (2025) 051002, doi: 10.1103/PhysRevLett.134.051002
30. M. Aguilar et al. (AMS Collaboration), "Solar Modulation of Cosmic Nuclei over a Solar Cycle: Results from the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 134 (2025) 051001, doi: 10.1103/PhysRevLett.134.051001
29. M. Aguilar et al. (AMS Collaboration), "Properties of Cosmic Deuterons Measured by the Alpha Magnetic Spectrometer", *Phys. Rev. Lett.* 132 (2024) 261001, doi: 10.1103/PhysRevLett.132.261001
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

3. M. Orcinha, F. Barão, B. Bertucci, E. Fiandrini, D. Pelosi and N. Tomassetti, "Understanding variations of galactic energetic particles in the heliosphere: modelling and radiation hazard assessment", Cent. Eur. Astrophys. Bull. 48 (2024), (awaiting publication), The 28th European Cosmic Ray Symposium — ECRS 2024, Hvar, Croatia, 23-27 September 2024
2. D. Pelosi, F. Barão, B. Bertucci, E. Fiandrini, M. Orcinha, A. Reina Conde and N. Tomassetti, "Cross-correlation analysis for cosmic ray flux forecasting", EPJ Web Conf. 319 (2025) 13004, Roma International Conference on AstroParticle Physics — RICAP-24, Frascati, Italy, 23-27 September 2024, doi: 10.1051/epjconf/202531913004
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, 6-10 July 2018

CONFERENCE & WORKSHOP PRESENTATIONS

Contributed talks at international conferences and workshops

- 8 Nov 2024** "Long-term variations of cosmic rays in the heliosphere: modelling, forecasting and radiation hazard assessment", M. Orcinha, F. Barão, B. Bertucci, F. Faldi, E. Fiandrini, D. Pelosi, N. Tomassetti, P. Väisänen, European Space Weather Week 2024 — ESWW2024, Coimbra, Portugal
- 25 Sep 2024** "Precision measurement of periodicities in the daily proton fluxes with the alpha magnetic spectrometer", M. Orcinha on behalf of AMS collaboration, 28th European Cosmic Ray Symposium — ECRS2024, Hvar, Croatia

23 Sep 2024 “An effective and predictive model for the long-term variations of Cosmic Rays in the Heliosphere”, M. Orcinha, F. Barão, B. Bertucci, E. Fiandrini, D. Pelosi, A. Reina Conde, N. Tomassetti, 28th European Cosmic Ray Symposium — ECRS2024, Hvar, Croatia

7 Jul 2018 “Observation of a time lag in solar modulation of cosmic rays in the heliosphere”, M. Orcinha, F. Barão, B. Bertucci, N. Tomassetti, 26th Extended European Cosmic Ray Symposium and 35th Russian Cosmic Ray Conference — ECRS+RCRC 2018, 18

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

27 Mar 2024 “Geomagnetic cutoff rigidity for dose studies & AMS daily flux”, M. Orcinha, Particle Astrophysics Perugia Group Meeting, Università degli Studi di Perugia — UniPG, Perugia, Italy

7 Dec 2023 “Wavelet analysis of the daily proton flux”, M. Orcinha, Particle Astrophysics Perugia Group Meeting, Università degli Studi di Perugia — UniPG, Perugia, Italy

30 Nov 2023 “Temporal variability of the cosmic-ray flux”, M. Orcinha, AMS Italia meeting, TIFPA — Trento Institute for Fundamental Physics and Applications, Trento, Italy

17 Nov 2023 “Optimization of Cutoff using differential acceptance — Bartel proton flux”, M. Orcinha, AMS Low-Energy meeting, Perugia, Italy

1 Mar 2018 “Solar Modulation Studies with Protons”, M. Orcinha, F. Barão, L. Derome, N. Tomassetti, AMS Collaboration General Analysis Meeting — Low Energy, Geneva, Switzerland

Poster sessions

05 Nov 2024 “Properties of Solar Energetic Particles with AMS-02 on the International Space Station”, F. Falldi, B. Bertucci, N. Tomassetti, M. Orcinha, 04-08 November 2024, European Space Weather Week — ESWW2024, Coimbra, Portugal

23 Sep 2024 “An effective and predictive model for the long-term variations of Cosmic Rays in the Heliosphere”, D. Pelosi, F. Barão, B. Bertucci, E. Fiandrini, M. Orcinha, A. Reina Conde, N. Tomassetti, 23-27 September 2024, RICAP24, Frascati, Italy

14 Apr 2024 “An effective and predictive model for the long-term variations of Cosmic Rays in the Heliosphere”, D. Pelosi, F. Barão, B. Bertucci, E. Fiandrini, M. Orcinha, A. Reina Conde, N. Tomassetti, 14–19 April 2024, European Geosciences Union — EGU, Vienna, Austria

14 Apr 2024 “Daily heliospheric modulation potential (V23) and modelled GCR dataset compared to space measurements of the GCR energy spectrum”, P. Väisänen, B. Bertucci, N. Tomassetti, M. Orcinha, M. Duranti, S. Koldobskiy and I. Usoskin, 14–19 April 2024, European Geosciences Union — EGU, Vienna, Austria

3 Apr 2024 “Recent low-energy results from the Alpha Magnetic Spectrometer on the International Space Station and their interpretations”, Incontri di Fisica delle Alte Energie — IFAE, Istituto degli Innocenti, Firenze, Italia

14 Sep 2023 “An effective and predictive model for the long-term variations of Cosmic Rays in the Heliosphere”, F. Barão, B. Bertucci, E. Fiandrini, M. Orcinha, D. Pelosi, A. Reina Conde, N. Tomassetti, 14 September 2023, 109 Congresso Nazionale, Società Italiana di Fisica, Salerno, Italy

6 Jul 2018 “Precision Measurement of the Monthly Cosmic Ray Fluxes with the Alpha Magnetic Spectrometer on the ISS”, 26th Extended European Cosmic Ray

ADVANCED EDUCATION

- Symposium and 35th Russian Cosmic Ray Conference, Altai State University, Barnaul & Belokurikha, Russia
12 Oct 2017 "Solar Modulation of Galactic Cosmic-Rays", Técnico Lisboa Research Activity during the Top Industrial Managers Europe General Assembly, 1
5-6 Apr 2017 "Solar Modulation of Galactic Cosmic-Rays", IST PhD OpenDays, Instituto Superior Técnico, Lisboa, Portugal

KNOWLEDGE TRANSFER

Participation in international schools

- Oct 2024** "XV INFN International School on Efficient Scientific Computing — ESC24", INFN & INFN Padova & INFN CNAF & Next-Generation Triggers, Bertinoro, Italy
Sep 2015 "3rd International Summer School on INtelligent Signal Processing for FrontIER Research and Industry — INFIERI", University of Hamburg & Deutsches Elektronen-Synchrotron (DESY), Hamburg, Germany

Invited talks at academic institutions

- 22 Nov 2024** "Radiazioni nello spazio: rischi, dosi e schermature", Part of the course "Fisica dello Spazio", taught by Nicola Tomassetti for the BSc and MSc in Physics of Dipartimento di Fisica e Geologia of Università degli Studi di Perugia, Italy
10 Jul 2024 "Introduction to Flux Estimation in AMS-02", Seminar for PhD students and Researchers, Dipartimento di Fisica e Geologia of Università degli Studi di Perugia, Italy
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

- 26 Nov 2024** Participation on "International Cosmic Day" (ICD-2024), 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
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 titled "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 titled "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 titled "Alpha Magnetic Spectrometer — A cosmic-ray observatory in space" for the *Fifth Lisbon mini-school on Particle and Astroparticle*

SCIENTIFIC PROJECTS	<i>Physics</i> , Costa da Caparica, Portugal	
	9 May 2018 Presented the lecture titled "LIP — Das profundezas da terra ao espaço (The AMS Experiment)" for the <i>32º aniversário do LIP</i> , Laboratório de Instrumentação e Física Experimental de Partículas, Lisboa, Portugal	
	22 Nov 2017 Presented the lecture titled "A Escuridão do Espaço — Matéria Escura e AMS" for the <i>A Semana da Ciência e Tecnologia no LIP</i> , Laboratório de Instrumentação e Física Experimental de Partículas, Lisboa, Portugal	
	AMS — Alpha Magnetic Spectrometer	May 2024 - present
	Title: Progetto ASI AMS-02 Missione Scientifica Analisi Dati	
	Funding: ASI — Agenzia Spaziale Italiana, ref. ASI-INFN 2019-19-HH.0, its amendments. No. 2021-43-HH.0.	
	Role: Researcher	
	CAESAR	Apr 2023 - May 2024
	Title: CAESAR — Comprehensive spAce wEather Studies for the ASPIS prototype Realization	
	Funding: INAF-ASI — Instituto Nazionale di Astrofisica, Agenzia Spaziale Italiana, Italy, ref. 2020-35-HH.0	
	Role: Researcher	
	AMS - Alpha Magnetic Spectrometer	2021 - 2023
	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	
	2024 - present — INFN Fellow of the Istituto Nazionale di Fisica Nucleare — INFN, Perugia, Italy	
	2023 - 2024 — 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, Geneve, Switzerland

Service

2022 - present — AMS Collaboration — shifter for the TEE sub-detector group (TRD, ACC, TRK).

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
- > CUDA
- > TBB
- > Threads
- > Forks
- > Inter-Process Communication (Signal, Message Queue, Socket, Shared Memory, Semaphores, Mutex, Conditions, MPI, Pipe)

Parallelization and Communication Technologies

- > Message Passing Interface (OpenMPI implementation in C/C++ and mpi4py in Python)
- > OpenMP

Signal Processing

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

Data Analysis

- > Wolfram Mathematica
- > ROOT — Data Analysis Fra-

- > mework, 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

- > I²C, 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_EX, L^AT_EX 2 _{ε} , B_IB_TE_X, TikZ, A_MS-L^AT_EX, MiK_TE_X, pdfl^AT_EX),
- > 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