

# MARIA PESTANA DA LUZ PEREIRA RAMOS

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CERN, Theory Department · Geneva, Switzerland

## RESEARCH INTERESTS

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Theoretical particle physics and phenomenology beyond the Standard Model. I combine model building with effective field theory to study the Higgs boson, dark matter, the strong CP problem and the QCD axion, confronting them with both collider and astrophysical probes.

*Beyond the Standard Model · Effective Field Theory · QCD axion & ALPs · Dark matter · Composite Higgs · Collider & astrophysical phenomenology*

## APPOINTMENTS

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<b>CERN, Theory Department</b> <i>Research Fellow, Theory group</i>	<b>Geneva, Switzerland</b> 2024 – present
<b>Instituto de Física Teórica (IFT) / Universidad Autónoma de Madrid</b> <i>Postdoctoral Researcher</i>	<b>Madrid, Spain</b> 2023 – 2024
<b>Universidad Autónoma de Madrid</b> <i>Early Stage Researcher — Marie Skłodowska-Curie ITN “HIDDeN”</i>	<b>Madrid, Spain</b> 2021 – 2023
<i>Short secondments</i>	
University of California San Diego — USA	Oct – Dec 2023
Université Paris-Saclay, IJCLab Orsay — France	Oct 2022
IGFAE, Santiago de Compostela — Spain	Jul 2021
IPPP, University of Durham — United Kingdom	Feb – Mar 2019

## EDUCATION

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<b>Ph.D. in Theoretical Physics</b> — <i>co-tutelle, Universidad de Granada (Spain) &amp; Universidade do Minho (Portugal)</i>	2018 – 2021
<i>The interplay between collider and astrophysical probes of composite Higgs models. Advisors: Dr. Mikael Chala (Granada), Prof. Nuno Castro (Minho). MAP-Fis Fellowship. Defended Jan 2022 — Sobresaliente Cum Laude (Granada), Muito Bom (Minho).</i>	
Ph.D. schools: ICTP Summer School on Particle Physics (2019); Cargèse International Summer School (2018).	
<b>M.Sc. in Theoretical Physics</b> — <i>Universidade do Porto, Portugal</i>	2015 – 2017
<i>CPT, modified gravity and the baryon asymmetry of the Universe. Advisor: Dr. Jorge Páramos. Grade: 19/20.</i>	
<b>B.Sc. in Physics</b> — <i>Universidade do Porto, Portugal</i>	2012 – 2015
<i>Dark energy models and observational imprints. Advisor: Prof. Carlos Martins. Extra-curricular internship at CAUP (2015).</i>	

## PUBLICATIONS

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18 articles (16 published, 2 under review) in high-impact peer-reviewed journals, plus 2 white papers and 2 reports. 660+ citations (INSPIRE). Author order follows field conventions: alphabetical in [hep-ph], by contribution in [astro-ph].

*Submitted manuscripts*

18. S. M. Lee, **M. Ramos**, F. Vilches. *How well can the QCD axion hide?* Submitted to JHEP. [[arXiv:2604.08657](#)]
17. **M. Ramos**, T. Cohen, M. Lisanti. *First-Principles Formalism for Simulating Self-Interacting Dark Matter.* Submitted to PRL. [[arXiv:2512.17998](#)]

*Published journal articles*

16. D. Dunskey, C. Manzari, P. Quílez, **M. Ramos**, P. Sorensen. *Resonant Landau–Zener conversion in multi-axion systems*. JHEP 01 (2026) 077. [[arXiv:2507.06287](#)]
15. A. de Giorgi, **M. Ramos**. *Extra-dimensional axion patterns*. Phys. Rev. D 111 (2025) 7. [[arXiv:2412.00179](#)]
14. B. Gavela, P. Quílez, **M. Ramos**. *The QCD axion sum rule*. JHEP 04 (2024) 056. [[arXiv:2305.15465](#)]
13. S. Das Bakshi, J. Machado, **M. Ramos**. *Running beyond ALPs: shift-breaking and CP-violating effects*. JHEP 11 (2023) 133. [[arXiv:2306.08036](#)]
12. J. Bonilla, A. de Giorgi, B. Gavela, L. Merlo, **M. Ramos**. *The cost of an ALP solution to the neutral B-anomalies*. JHEP 02 (2023) 138. [[arXiv:2209.11247](#)]
11. D. Domènech, M. J. Herrero, R. A. Morales, **M. Ramos**. *Double Higgs production at TeV  $e+e-$  colliders with Effective Field Theories: sensitivity to BSM Higgs couplings*. Phys. Rev. D 106 (2022) 115027. [[arXiv:2208.05452](#)]
10. X. Cid Vidal, T. Mombächer, **M. Ramos**, E. Rodríguez. *Following the muon track of hierarchical sectors at LHCb*. JHEP 11 (2022) 027. [[arXiv:2206.01759](#)]
9. M. Chala, G. Guedes, **M. Ramos**, J. Santiago. *Towards the renormalisation of the SM effective field theory to dimension eight: Bosonic interactions I*. SciPost Phys. 11 (2021) 065. [[arXiv:2106.05291](#)]
8. M. Chala, G. Guedes, **M. Ramos**, J. Santiago. *Running in the ALPs*. Eur. Phys. J. C 81 (2021) 181. [[arXiv:2012.09017](#)]
7. N. Castro, M. Chala, A. Peixoto, **M. Ramos**. *Novel flavour-changing neutral currents in the top quark sector*. JHEP 10 (2020) 038. [[arXiv:2005.09594](#)]
6. M. Chala, P. Kozów, **M. Ramos**, A. Titov. *Effective field theory for vector-like leptons and its collider signals*. Phys. Lett. B 809 (2020) 135752. [[arXiv:2005.09655](#)]
5. **M. Ramos**. *Composite dark matter phenomenology in the presence of lighter degrees of freedom*. JHEP 07 (2020) 128. [[arXiv:1912.11061](#)]
4. A. Blance, M. Chala, **M. Ramos**, M. Spannowsky. *Novel B-decay signatures of light scalars at high energy facilities*. Phys. Rev. D 100 (2019) 115015. [[arXiv:1907.13151](#)]
3. M. Chala, **M. Ramos**, M. Spannowsky. *Gravitational wave and collider probes of a triplet Higgs sector with a low cutoff*. Eur. Phys. J. C 79 (2019) 156. [[arXiv:1812.01901](#)]
2. J. Páramos, **M. Ramos**. *Baryogenesis in non-minimally coupled  $f(R)$  theories*. Phys. Rev. D 96 (2017) 104024. [[arXiv:1709.04442](#)]
1. C. Martins, M. Martinelli, E. Calabrese, **M. Ramos**. *Real-time cosmography with redshift derivatives*. Phys. Rev. D 94 (2016) 043001. [[arXiv:1606.07261](#)]

*White papers*

2. A. Arza *et al.* *The physics case for Weakly Interacting Slim Particles*. Submitted to PRL. [[arXiv:2603.03433](#)]
1. M. Borsato *et al.* *Unleashing the full power of LHCb to probe Stealth New Physics*. Rep. Prog. Phys. 85 (2022) 2. [[arXiv:2105.12668](#)]

*Other reports*

2. J. Bonilla, A. de Giorgi, **M. Ramos**. *Report on neutral B-anomalies from an on-shell scalar exchange*. [[arXiv:2211.05135](#)]
1. A. Bethani *et al.* *Report on the ECFA Early-Career Researchers Debate on the 2020 European Strategy Update for Particle Physics*. [[arXiv:2002.02837](#)]

## AWARDS & HONORS

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<b>V DFTP Prize</b> for Best Doctoral Thesis in Theory — <i>Spanish Royal Physics Society (Theoretical &amp; Particle Physics Div.)</i>	2022
<b>Extraordinary Prize</b> for Best Doctoral Thesis in Science — <i>University of Granada</i>	2021–22
<b>Recognition Award</b> for Best Doctoral Thesis — <i>School of Sciences, University of Minho</i>	2022

## INVITED TALKS & SEMINARS

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19 seminars and 18 international conferences. Selected highlights by year:

- 2026** Plenary, *Planck 2026*; Plenary, *Blois Workshop 2026*; CERN-TH Cosmo Seminar; Parallel talk, Int. Workshop on the Circular Electron–Positron Collider.
- 2025** Seminar, ETH Zürich; Review talk, LII Int. Meeting on Fundamental Physics; Colloquium, IST Lisbon; Plenary, Pollica workshop “The strong CP problem”; Plenary, “Dark Matter Beyond the Weak Scale III” (UK); Plenary, 8th FCC Physics Workshop (CERN).
- 2024** CERN BSM Forum Seminar; Mainz Theorie Palaver; Heidelberg Teilchen-Tee; Plenary, PASCOS (Rencontres du Vietnam); Seminar, Oskar Klein Centre; Seminar, U. Granada; Plenary, COSMIC WISPer Meeting (DESY).
- 2023** Seminar, Berkeley Center for Theoretical Physics; Seminar, UC Santa Cruz; Seminar, UC San Diego; Plenary, LAPTh “Axions++”; DESY Seminar; INFN Padova Seminar.
- 2022** Plenary, CERN “Implications of LHCb measurements”; Seminar, IJCLab Orsay; Plenary, IGFAE “Multimuon signatures at LHCb”; Plenary, Invisibles Workshop; Plenary, CPAN.
- 2021** “Higgs Hunting” Workshop; Seminar, IFT Madrid; Seminar, IGFAE Santiago; Plenary, LIO “Composite connection of Higgs, dark matter and neutrinos”.
- 2020** Parallel talk, “Flavour Physics and CP Violation”; Seminar, U. Granada; Plenary, “Stealth physics at LHCb”.
- 2019** Seminar, U. Aveiro; Seminar, IPPP Durham.

## CONFERENCE & WORKSHOP ORGANIZATION

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- **MITP Institute “ALPs Across Scales”** (2026) — Co-organizer, U. Mainz.
- **Gen-HET BSM Meeting** (2026) — Co-organizer, CERN.
- **COSMIC WISPer General Meeting** (2026) — Co-organizer, CERN.
- **Invisibles Workshop** (2025) — Co-organizer, CERN.
- **CERN-TH Institute “Evolving Beyond the Standard Model”** (2025) — Co-organizer, CERN.
- **HEFT Conference** (2025, CERN; 2022, Granada) — Co-organizer.

Research-group meetings: Co-organizer of the CERN Theory Journal Club (2024–present), Pheno Coffee at IFT Madrid (2021–2024), and the LIP Phenomenology Journal Club (proposer & co-organizer, 2018–2020).

## GRANTS & PROJECTS

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<b>COSMIC WISPer</b> COST Action — Management Committee member (PI A. Mirizzi, Bari; EU COST CA21106)	2022 – 2026
<b>Long-Lived Particles &amp; BSM searches</b> — research group member (PI X. Cid Vidal, IGFAE/LHCb; Spanish Ministry of Science)	2023 – 2026
<b>H2020-MSCA-ITN “HIDDeN”</b> — early-career fellow (PI S. Pascoli, Bologna; Marie Skłodowska-Curie #860881)	2021 – 2023

## SUPERVISION & MENTORSHIP

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- **Saimum Sayeed** — CERN/EPFL Summer Master student (2026), Observatoire de Paris. With Prof. T. Cohen & Dr. D. Harvey. Foundations of self-interacting dark matter simulations.

- **Fuensanta Vilches** — Ph.D. student (2024–2028), U. Granada. With Dr. M. Chala. QCD axion phenomenology and new-physics searches.
- **Jean-Loup Raymond** — IFT Summer Master student (2023), ENS Paris-Saclay. With Prof. B. Gavela. Anomalous symmetries and the strong CP problem.

## SERVICE & COMMITTEES

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- **European Committee for Future Accelerators (ECFA)** — early-career representative of the CERN theory group (2024–present).
- **COSMIC WISPers COST Action** — Management Committee, Swiss representative.
- **Ph.D. thesis jury** — Emilio Rodríguez (Experimental Particle Physics, U. Santiago de Compostela, 2025); president of the jury & external reviewer.
- **Peer review** — Physics Letters B; European Physical Journal C; Journal of High Energy Physics.
- **EDI Committee, IFT Madrid** — elected Postdoc Representative (2022–2023).

## TEACHING

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- **Física Nuclear y de Partículas Elementales** (10h) — Tutor, B.Sc., Universidad Autónoma de Madrid (2023).
- **Physics of Fundamental Particles** (3h) — Lecturer, LIP Summer Student Programme, U. Minho (2018).
- **Invisibles Schools** (10h) — Lecturer & Tutor, Bad Honnef (2023); Tutor, “Theory & Phenomenology of the SMEFT”, Paris-Saclay (2022).

## OUTREACH & PUBLIC ENGAGEMENT

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- **Quantum Fracture Podcast** (2023) — invited guest, Elementary Particle Physics episode — 280,000+ views.
- **CERN Masterclasses** (2015–2021) — Teaching Assistant & Organizer; U. Minho, IPPP Durham, U. Porto.
- **European Researchers’ Night** (2019), Braga · **CAUP Astronomy Day** (2015), Porto — public lectures.
- **GenHET Newsletter** (2026) — co-author; interview on diversity and mentorship in particle physics.