Nicholas L. Rodd

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Positions

CERN 2021-present
LD Staff Member

University of California, Berkeley 2018-2021
Miller Research Fellow

Education

Massachusetts Institute of Technology 2013-2018
Ph.D. Physics
Advisor: Tracy Slatyer
Thesis: Listening to the Universe through Indirect Detection

Melbourne University 2011-2012
M.Sc. (Distinction) Physics
Advisor: Raymond Volkas and Elisabetta Barberio
Thesis: Analysis of neutrino mass effective operators and testing their signatures at the Large Hadron Collider

Melbourne University 2006-2010
B.Sc. & LL.B. (Hons)

Selected Awards

APS DAP Cecilia Payne-Gaposchkin Thesis Award	2020
J. J. and Noriko Sakurai Dissertation Award in Theoretical Particle Physics	2019
Price Prize in Cosmology and AstroParticle Physics	2017
Andrew M. Lockett III Memorial Fund Award, MIT	2016
Fulbright Postgraduate Scholarship (declined)	2013
Australian Students Prize	2005

Plenaries & Colloquia[‡]

Novel approaches to characterise the Galactic Centre Excess, Annecy	March 2023
University of California, Davis	March 2023
Aspen Center for Physics	August 2022
University of Amsterdam GRAPPA	June 2022
Exploring the Dark Universe 33rd Rencontres de Blois, Blois, France	May 2022
Snowmass Theory Frontier Conference, Santa Barbara, USA	February 2022
XIX International Workshop on Neutrino Telescopes, Virtual	February 2021
Melbourne University	December 2019
Next Frontiers in the Search for Dark Matter, Florence, Italy	September 2019
In Pursuit of New Particles and Paradigms, Aspen, USA	March 2019

Selected Publications

- K. Langhoff, N. J. Outmezguine, N. L. Rodd — Phys.Rev.Lett. **129** (2022) 241101, arXiv:2209.06216
  The Irreducible Axion Background
- V. Domcke, C. Garcia-Cely, N. L. Rodd — Phys.Rev.Lett. **129** (2022) 041101, arXiv:2202.00695
  A novel search for high-frequency gravitational waves with low-mass axion haloscopes
- C. W. Bauer, N. L. Rodd, B. R. Webber — JHEP **06** (2021) 121, arXiv:2007.15001
  Dark Matter Spectra from the Electroweak to the Planck Scale
- G. N. Remmen, N. L. Rodd — Phys.Rev.Lett. **125** (2020) 081601, arXiv:2004.02885
  Flavor Constraints from Unitarity and Analyticity
- C. Dessert, N. L. Rodd, B. R. Safdi — Science 367 (2020) 6485, arXiv:1812.06976
  The dark matter interpretation of the 3.5-keV line is inconsistent with blank-sky observations

[‡] Talks listed in blue contain a link to a recording

51. The ADMX Collaboration — arXiv:2303.06282
Search for the Cosmic Axion Background with ADMX

50. The VERITAS Collaboration — Astrophys.J. **945** (2023) 101 arXiv:2302.08784
Search for Ultraheavy Dark Matter from Observations of Dwarf Spheroidal Galaxies with VERITAS

49. M. Freytsis, S. Kumar, G. N. Remmen, N. L. Rodd — arXiv:2210.10791
Multifield Positivity Bounds for Inflation

48. J. A. Dror, S. Gori, J. M. Leedom, N. L. Rodd — arXiv:2210.06481
On the Sensitivity of Spin-Precession Axion Experiments

47. A. Montanari, E. Moulin, N. L. Rodd — Phys.Rev. **D107** (2023) 043028 arXiv:2210.03140
Towards the ultimate reach of current Imaging Atmospheric Cherenkov Telescopes to TeV Dark Matter

46. K. Langhoff, N. J. Outmezguine, N. L. Rodd — Phys.Rev.Lett. **129** (2022) 241101 arXiv:2209.06216
The Irreducible Axion Background

45. D. Tak, M. Baumgart, N. L. Rodd, E. Pueschel — Astrophys.J. **938** (2022) L4 arXiv:2208.11740
Current and future γ-ray searches for dark-matter annihilation beyond the unitarity limit

44. G. N. Remmen, N. L. Rodd — JHEP **09** (2022) 030 arXiv:2206.13524
Spinning Sum Rules for the Dimension-Six SMEFT

43. V. Domcke, C. Garcia-Cely, N. L. Rodd — Phys.Rev.Lett. **129** (2022) 041101 arXiv:2202.00695
A novel search for high-frequency gravitational waves with low-mass axion haloscopes

42. F. List, N. L. Rodd, G. F. Lewis — Phys.Rev. **D104** (2021) 123022 arXiv:2107.09070
Dim but not entirely dark: Extracting the Galactic Center Excess' source-count distribution with neural nets

41. G. H. Collin, N. L. Rodd, T. Erjavec, K. Perez — Astrophys.J. **260** (2022) 29 arXiv:2104.04529
A Compound Poisson Generator approach to Point-Source Inference in Astrophysics

40. The ABRACADABRA Collaboration — Phys.Rev.Lett. **127** (2021) 081801 arXiv:2102.06722
The search for low-mass axion dark matter with ABRACADABRA-10cm

39. J. W. Foster, M. Kongsore, C. Dessert, Y. Park, N. L. Rodd, K. Cranmer, B. R. Safdi — Phys.Rev.Lett. **127** (2021) 051101 arXiv:2102.02207
A deep search for decaying dark matter with XMM-Newton blank-sky observations

38. J. A. Dror, H. Murayama, N. L. Rodd — Phys.Rev. **D103** (2021) 115004† arXiv:2101.09287
The Cosmic Axion Background

37. G. N. Remmen, N. L. Rodd — Phys.Rev. **D105** (2022) 036006 arXiv:2010.04723
Signs, Spin, SMEFT: Sum Rules at Dimension Six

36. J. W. Foster, Y. Kahn, R. Nguyen, N. L. Rodd, B. R. Safdi — Phys.Rev. **D103** (2021) 076018† arXiv:2009.14201
Dark Matter Interferometry

35. L. Rinchiuso, O. Macias, E. Moulin, N. L. Rodd, T. R. Slatyer — Phys.Rev. **D103** (2021) 023011 arXiv:2008.00692
Prospects for Heavy WIMP Dark Matter with CTA: the Wino and Higgsino

34. C. W. Bauer, N. L. Rodd, B. R. Webber — JHEP **06** (2021) 121 arXiv:2007.15001
Dark Matter Spectra from the Electroweak to the Planck Scale

33. I. Baldes, F. Calore, K. Petraki, V. Poireau, N. L. Rodd — SciPost Phys. **9** (2020) 068 arXiv:2007.13787
Indirect searches for dark matter bound state formation and level transitions

32. F. List, N. L. Rodd, G. F. Lewis, I. Bhat — Phys.Rev.Lett. **125** (2020) 241102 arXiv:2006.12504
The GCE in a New Light: Disentangling the γ-ray Sky with Bayesian Graph Convolutional Neural Networks

31. C. Dessert, N. L. Rodd, B. R. Safdi — Phys.Dark Univ. **30** (2020) 100656 arXiv:2006.03974
Response to a comment on Dessert et al. "The dark matter interpretation of the 3.5 keV line is inconsistent with blank-sky observations"

† Editors' Suggestion

Publications (cont.)

30. G. N. Remmen, N. L. Rodd — Phys.Rev.Lett. **125** (2020) 081601
Flavor Constraints from Unitarity and Analyticity — arXiv:2004.02885

29. M. Buschmann, N. L. Rodd, B. R. Safdi, L. J. Chang, S. Mishra-Sharma, M. Lisanti, O. Macias — Phys.Rev. **D102** (2020) 023023
Foreground Mismodeling and the Point Source Explanation of the Fermi Galactic Center Excess — arXiv:2002.12373

28. The IceCube Collaboration — Astrophys.J. **893** (2020) 102
A Search for Neutrino Point-Source Populations in 7 Years of IceCube Data with Neutrino-count Statistics — arXiv:1909.08623

27. L. J. Chang, S. Mishra-Sharma, M. Lisanti, M. Buschmann, N. L. Rodd, B. R. Safdi — Phys.Rev. **D101** (2020) 023014
Characterizing the Nature of the Unresolved Point Sources in the Galactic Center — arXiv:1908.10874

26. G. N. Remmen, N. L. Rodd — JHEP **12** (2019) 032
Consistency of the Standard Model Effective Field Theory — arXiv:1908.09845

25. The ABRACADABRA Collaboration — Phys.Rev. **D99** (2019) 052012
Design and Implementation of the ABRACADABRA-10 cm Axion Dark Matter Search — arXiv:1901.10652

24. C. Dessert, N. L. Rodd, B. R. Safdi — Science 367 (2020) 6485
The dark matter interpretation of the 3.5-keV line is inconsistent with blank-sky observations — arXiv:1812.06976

23. The ABRACADABRA Collaboration — Phys.Rev.Lett. **122** (2018) 121802
First Results from ABRACADABRA-10 cm: A Search for Sub-μeV Axion Dark Matter — arXiv:1810.12257

22. M. Baumgart, T. Cohen, E. Moulin, I. Moult, L. Rinchiuso, N. L. Rodd, T. R. Slatyer, I. W. Stewart, V. Vaidya — JHEP **01** (2019) 036
Precision Photon Spectra for Wino Annihilation — arXiv:1808.08956

21. L. Rinchiuso, N. L. Rodd, I. Moult, E. Moulin, M. Baumgart, T. Cohen, T. R. Slatyer, I. W. Stewart, V. Vaidya — Phys.Rev. **D98** (2018) 123014
Hunting for Heavy Winos in the Galactic Center — arXiv:1808.04388

20. M. Baumgart, T. Cohen, I. Moult, N. L. Rodd, T. R. Slatyer, M. P. Solon, I. W. Stewart, V. Vaidya — JHEP **03** (2018) 117
Resummed Photon Spectra for WIMP Annihilation — arXiv:1712.07656

19. J. W. Foster, N. L. Rodd, B. R. Safdi — Phys.Rev. **D97** (2018) 123006
Revealing the Dark Matter Halo with Axion Direct Detection — arXiv:1711.10489

18. The HAWC Collaboration — JCAP **1802** (2018) 049
A Search for Dark Matter in the Galactic Halo with HAWC — arXiv:1710.10288

17. R. Bartels, D. Hooper, T. Linden, S. Mishra-Sharma, N. L. Rodd, B. R. Safdi, T. R. Slatyer — Phys.Dark Univ. **20** (2016) 88
Comment on "Characterizing the population of pulsars in the Galactic bulge with the Fermi Large Area Telescope" [arXiv:1705.00009v1] — arXiv:1710.10266

16. R. E Keeley, S. N. Abazajian, A. Kwa, N. L. Rodd, B. R. Safdi — Phys.Rev. **D97** (2018) 103007
What the Milky Way's Dwarfs tell us about the Galactic Center extended excess — arXiv:1710.03215

15. M. Lisanti, S. Mishra-Sharma, N. L. Rodd, B. R. Safdi, R. H. Wechsler — Phys.Rev. **D97** (2018) 063005
Mapping Extragalactic Dark Matter Annihilation with Galaxy Surveys: A Systematic Study of Stacked Group Searches — arXiv:1709.00416

14. M. Lisanti, S. Mishra-Sharma, N. L. Rodd, B. R. Safdi — Phys.Rev.Lett. **120** (2018) 101101
A Search for Dark Matter Annihilation in Galaxy Groups — arXiv:1708.09385

13. P. Ilten, N. L. Rodd, J. Thaler, M. Williams — Phys.Rev. **D96** (2017) 054019
Disentangling Heavy Flavor at Colliders — arXiv:1702.02947

Publications (cont.)

12. T. Cohen, K. Murase, N. L. Rodd, B. R. Safdi, Y. Soreq — Phys.Rev.Lett. **119** (2017) 021102
Gamma-ray Constraints on Decaying Dark Matter and Implications for IceCube — arXiv:1612.05638

11. G. Ovanesyan, N. L. Rodd, T. R. Slatyer, I. W. Stewart — Phys.Rev. **D95** (2017) 055001
The One-Loop Correction to Heavy Dark Matter Annihilation — arXiv:1612.05638

10. S. Mishra-Sharma, N. L. Rodd, B. R. Safdi — Astron.J. **153** (2017) 253
NPTFit: A code package for Non-Poissonian Template Fitting — arXiv:1612.03173

9. T. Linden, N. L. Rodd, B. R. Safdi, T. R. Slatyer — Phys.Rev. **D94** (2016) 103013
The High-Energy Tail of the Galactic Center Gamma-Ray Excess — arXiv:1604.01026

8. G. Elor, N. L. Rodd, T. R. Slatyer, W. Xu — JCAP **1606**, 024 (2015)
Model-Independent Indirect Detection Constraints on Hidden Sector Dark Matter — arXiv:1511.08787

7. G. Elor, N. L. Rodd, T. R. Slatyer — Phys.Rev. **D91** (2015) 103531
Multi-Step Cascade Annihilations of Dark Matter and the Galactic Center Excess — arXiv:1503.01773

6. T. Daylan, D. P. Finkbeiner, D. Hooper, T. Linden, S. K. N. Portillo, N. L. Rodd, T. R. Slatyer — Phys.Dark Univ. **12** (2016) — arXiv:1402.6703
The Characterization of the Gamma-Ray Signal from the Central Milky Way: A Case for Annihilating Dark Matter

5. P. W. Angel, Y. Cai, N. L. Rodd, M. A. Schmidt, R. R. Volkas — JHEP **10** (2013) 118
Testable two-loop radiative neutrino mass model based on an $LLQd^cQd^c$ effective operator — arXiv:1308.0463

4. A. Kobakhidze, N. L. Rodd — Int.J.Theor.Phys. **52** (2013) 2636
Time-symmetric quantization in spacetimes with event horizons — arXiv:1307.5126

3. P. W. Angel, N. L. Rodd, R. R. Volkas — Phys.Rev. **D87** (2013) 073007
Origin of neutrino masses at the LHC: $\Delta L = 2$ effective operators and their ultraviolet completions — arXiv:1212.6111

2. The ATLAS Collaboration — JHEP **12** (2012) 7
Search for anomalous production of prompt like-sign lepton pairs at $\sqrt{s} = 7$ TeV with the ATLAS detector — arXiv:1210.4538

1. The ATLAS Collaboration — Eur.Phys.J. **C72** (2012) 2244
Search for doubly charged Higgs bosons in like-sign dilepton final states with the ATLAS detector — arXiv:1210.5070
(Only listed as internal author on this paper due to ATLAS regulations allowing a maximum of one publication before service work has been completed.)

White Papers

8. M. Baumgart, N. L. Rodd, et al. — arXiv:2210.03199
Snowmass Theory Frontier: Effective Field Theory

7. D. Green, N. L. Rodd, et al. — arXiv:2209.06854
Snowmass Theory Frontier: Astrophysics and Cosmology

6. K. K. Boddy, M. Lisanti, S. D. McDermott, N. L. Rodd,* C. Weniger, et al. — JHEAp **35** (2022) 112 — arXiv:2203.06380
Astrophysical and Cosmological Probes of Dark Matter

5. D. Carney, N. L. Rodd, et al. — arXiv:2203.06508
Ultraheavy particle dark matter

4. S. Ando, N. L. Rodd, et al. — arXiv:2203.06781
Synergies between dark matter searches and multiwavelength/multimessenger astrophysics

3. R. Leane, N. L. Rodd, et al. — arXiv:2203.06859
Puzzling Excesses in Dark Matter Searches and How to Resolve Them

2. K. Engel, N. L. Rodd, et al. — arXiv:2203.07360
The Future of Gamma-Ray Experiments in the MeV-EeV Range

1. M. Baumgart, N. L. Rodd, et al. — arXiv:2203.08204
Effective Field Theories for Dark Matter Phenomenology

* Editor

Conference Talks[‡]

Novel approaches to characterise the Galactic Centre Excess, Annecy	March 2023
17th IAXO Collaboration Meeting, DESY	March 2023
19th Rencontres du Vietnam, Quy Nhon, Vietnam	January 2023
Particle Avenues in the Dark Universe Arena (PADUA), Padua, Italy	September 2022
CERN-CKC workshop, Jeju Island, South Korea	June 2022
Novel Hidden Sectors: From Colliders to Cosmology, Munich, Germany	May 2022
Computational Tools for High Energy Physics and Cosmology, Virtual	November 2021
New Physics from The Sky, Florence, Italy	October 2021
PANIC 2021 Lisbon Portugal, Virtual	September 2021
CMB-S4 collaboration meeting, Virtual	August 2021
Electroweak effects at high energy, Virtual	September 2020
DM Radio Collaboration Meeting, Virtual	August 2020
APS April Meeting, Virtual	April 2020
New Techniques for Dark Matter Discovery, Vancouver, Canada	March 2020
TeV Particle Astrophysics 2019, Sydney, Australia	December 2019
NEPLES-2019, Seoul, South Korea	September 2019
APS April Meeting, Denver, USA	April 2019
Berkeley week at IPMU, Kashiwa, Japan	January 2019
TeV Particle Astrophysics 2018, Berlin, Germany	August 2018
TeV Particle Astrophysics 2017, Columbus, USA	August 2017
Cosmic Rays, Pulsars & Dark Matter, Santa Fe, USA	March 2017
CosPA 2016, Sydney, Australia	November 2016
TeV Particle Astrophysics 2016, CERN, Switzerland	September 2016
LoopFest XV, Buffalo, USA	August 2016
Gamma Rays & Dark Matter, Obergurgl, Austria	December 2015
Intense Electron Beams Workshop, Ithaca, USA	June 2015
CIPANP 2015, Vail, USA	May 2015
Astroparticle Physics 2014, Amsterdam, Netherlands	June 2014
Strings and Super Yang Mills, Melbourne, Australia	April 2013
Australian-Italian Symposium, Melbourne, Australia	April 2012
CoEPP Workshop, Lorne, Australia	February 2012

Invited Seminars[‡]

Tel Aviv University, Weizmann, ICTP, EPFL, LAPTh, Boston University, The University of British Columbia, UC Davis	2023
UIUC, Stanford, UC Berkeley, LBNL, University of Victoria and TRIUMF (joint), University of Floria and Florida State University (joint), DESY, University of Geneva (Cosmology department), University of Geneva (Particle Physics department), Technion, Hebrew University	2022
Miller Lunch Talk, University of Cambridge, University of Michigan, Rutgers University, CERN, University of Sydney, Kavli IPMU, ARC Centre of Excellence for Dark Matter, University of Melbourne, KASI, McGill University, UC Santa Cruz	2021
LHC Results Forum, UC Santa Cruz, INPA LBNL, UC Davis, University of Maryland, BSM PANDEMIC, Brown University, KICP, University of Minnesota, Technical University of Munich, Korea Institute for Advanced Study, University of Padua	2020
UC San Diego, UC Davis, University of Washington, UC Santa Cruz, SLAC	2019
Stanford, Melbourne University, UC Berkeley	2018
Harvard, University of Michigan, Princeton, The Ohio State University (Price Prize Seminar), UC Berkeley, UC Irvine, University of Oregon, Fermilab, New York University, The Ohio State University, Perimeter Institute, Virginia Tech, Pennsylvania State University	2017
Monash University, Melbourne University, McGill University	2016

Teaching[‡]

Schools and Lectures

- BCVSPIN-2021: Probing the Mysteries of the Universe — January 2022
- IPMU Pedagogical Seminar Series — November 2021

[‡] Talks listed in blue contain a link to a recording

Teaching (Cont.)

Quantum Field Theory 1 (TA and delivered 4 lectures), MIT (6.3/7)	Spring 2018
Relativity (TA), MIT (6.0/7)	Fall 2017
Relativity (TA), MIT	Fall 2014
Quantum Field Theory (TA), Melbourne University	2013
Physics for Biomed (Recitation Instructor), Melbourne University	2012
Introductory physics laboratory (Demonstrator), Melbourne University	2011

(Student evaluation scores are given in parentheses where available.)

Service

Referee: Physical Review Letters, Physical Review D, Journal of High Energy Physics, Physics Letters B, SciPost, The Astrophysical Journal, Computer Physics Communication

Organizer for the *Third EuCAPT Annual Symposium*	May 2023
Organizer for the 34th Rencontres de Blois	May 2023
Organizer for the 19th Rencontres du Vietnam	January 2023
Management Committee, *COST Action COSMIC WISPers in the Dark Universe*	2022-
Organized *Second EuCAPT Annual Symposium*	May 2022
Organized *New Methods and Ideas at the Frontiers of Particle Physics* (Winter Aspen)	March 2022
Organizer of the HEP/Astro Results Forum	2021-
Convener for COSMO'21, University of Illinois and Online	August 2021
Convener for TeVPA 2019, Sydney, Australia	December 2019
Co-organizer of mini-workshop on the Galactic Center excess, Columbus, OH	August 2017
Organizer of summer school on the NPTF, MIT	June 2017
LBNL Particle Seminar Organizer, Lawrence Berkeley National Laboratory	2019-2020
Beyond the Standard Model Journal Club Organizer, MIT	2015-2017

Ph.D. Thesis Committee

* Harrison Ploeg, "The Galactic Millisecond Pulsar Population – Implications for the Galactic Center Excess" (Chris Gordon, University of Canterbury) August 2021

Outreach

Interviewed to outline the work of a theorist for the CERN Science Gateway	2022
Dark matter presentation to school students visiting CERN from the UK and Israel	2022
Public talk for Dark Matter Day at CERN – recording available here	2022
Interview on Radio Physics	2022
Interview with The Scientist Reach Out Group – recording available here	2022
Presentation at the Berkeley High School Physics Club – recording available here	2021
Organizer of and Presenter at "Meet a Miller Fellow," El Cerrito High School	2020-2021
Adopt-a-Physicist	2020
Presentation to PHYS 153 transfer students, UC Berkeley	2020

Awards

APS DAP Cecilia Payne-Gaposchkin Thesis Award	2020
J. J. and Noriko Sakurai Dissertation Award in Theoretical Particle Physics	2019
Miller Research Fellowship	2018
Price Prize in Cosmology and AstroParticle Physics	2017
Andrew M. Lockett III Memorial Fund Award, MIT	2016
American Australian Association's ConocoPhillips Fellowship	2015
Acevedo Fellowship, MIT	2015
Kerman Fellowship, MIT	2013
Fulbright Postgraduate Scholarship (declined)	2013
Henry James Williams Scholarship, Melbourne University	2012
Dean's Honours List in MSc Physics, Melbourne University	2012
Bryan Scholarship in Natural Science, Melbourne University	2011
Master of Science National Scholarship, Melbourne University	2011
Raynes Dickson Memorial Exhibition in Deals, Melbourne University	2010
Dean's Honours List in BSc/LLB, Melbourne University	2008
Dean's Honours List in BSc/LLB, Melbourne University	2006
VCE Premiers All Round High Achiever	2005
Australian Students Prize	2005
Dux of Melbourne Grammar School	2005

References

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Christoph Weniger University of Amsterdam c.weniger@uva.nl
Gian Giudice CERN Gian.Giudice@cern.ch