

# Amin Abouibrahim

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## Curriculum Vitae

### Education

- 2017–2020 **Ph.D. in Theoretical Particle Physics**, *Northeastern University*, Boston.  
2015–2017 **Master of Science**, *Northeastern University*, Boston.  
Major: Physics  
2002–2006 **Bachelor of Science**, *Lebanese University*, Hadath.  
Major: Physics [Final project: Nucleosynthesis in Core Collapse Supernova]

### Doctorate Thesis

- Title *Testing supersymmetry at future high energy colliders, in dark matter and high precision experiments*  
Advisor Professor Pran Nath

### Masters Thesis

- Title *Lepton Physics in Extensions of the MSSM with Vectorlike Generation*  
Supervisor Professor Tarek Ibrahim

### Experience

#### Postdoctoral positions

- 2020–2023 **Postdoctoral researcher**, INSTITUTE FOR THEORETICAL PHYSICS, UNIVERSITY OF MÜNSTER, Germany.

#### Teaching and Research

- 2025–Present **Assistant Professor of Physics**, UNIVERSITY OF HARTFORD, West Hartford, CT.  
2023–2025 **Visiting Assistant Professor**, UNION COLLEGE, Schenectady, NY.  
Teaching PHY-120, PHY-121, IMP-120 (lecture and lab), PHY-493 (Particle Physics)  
Research in Particle Cosmology  
2020–2023 **Teaching Assistant**, INSTITUTE FOR THEORETICAL PHYSICS, Muenster.  
Conducting tutorial sessions for MS and PhD students in: Quantum field theory, Introduction to the Standard Model and Physics Beyond the Standard Model

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- 2015–2020 **Teaching Assistant**, NORTHEASTERN UNIVERSITY, Boston.  
Teaching introductory physics labs for physics 1 and 2: PHYS 1148, PHYS 1152, PHYS 1156 and Physics lab for pharmacy  
College of Professional Studies (CPS): Physics 1 and 2  
US Pathway Program (USPP) Summer Bridge: Physics 1  
Interactive Learning Session: PHYS 1157
- 2006–2015 **High School Physics Teacher**, SABIS<sup>®</sup> INTERNATIONAL SCHOOL, Beirut.  
Taught high school mathematics and physics.
- Courses Taught:
- University Physics
  - Physics AP (B & C) and A levels
  - Physics Honours (Modern Physics)
  - Mechanics and Core Physics
  - Calculus I and II and Linear Algebra
- Coordination
- 2010–2015 **Physics Head of Department**, SABIS<sup>®</sup> International School.  
Physics HOD, coordinator and teacher.
- Training/Mentoring/Supervision
- 2020–2023 **Supervision**, *Institute for theoretical physics, Muenster*.  
Supervising BSc, MSc and PhD students working towards their thesis
- 2016–2020 **TA Training**, *Northeastern University*.  
Training teaching assistants on handling labs and grading: PHYS 7220/30
- 2019 **TA Training Workshop**, *Georgia Institute of Technology, Atlanta, GA*.  
Cottrell Scholars Collaborative, National Teaching Assistant Workshop
- 2010–2015 **Controlling Academic Quality**, SABIS<sup>®</sup> International School.  
Training and mentoring teachers on the SABIS<sup>®</sup> point system

## Awards

- 2021 Best talk award at the 10th International Conference on New Frontiers in Physics (ICNFP 2021), Crete, Greece
- 2020 College of Science Dean's Graduate Student Excellence Award in Research – Northeastern University
- 2020 Lawrence Award for excellence in teaching (Advanced) – Northeastern University
- 2019 Lawrence Award for excellence in teaching (Advanced) – Northeastern University
- 2018 Journal Club Speaker prize – Northeastern University
- 2018 Lawrence Award for excellence in teaching (Advanced) – Northeastern University
- 2017 Lawrence Award for excellence in teaching (Second year) – Northeastern University
- 2017 PITT PACC Award – Phenomenology 2017, University of Pittsburgh
- 2016 Lawrence Award for excellence in teaching (First year) – Northeastern University

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## References

- [1] **Pran Nath**, *Northeastern University*, Matthews Distinguished University Professor.  
p.nath@northeastern.edu
- [2] **Michael Klasen**, *Institute for theoretical physics, University of Muenster*, Professor of Physics.  
michael.klasen@uni-muenster.de
- [3] **Chad Orzel**, *Union College*, R. Gordon Gould Associate Professor of Physics and Astronomy - Chair of the Department.  
orzalc@union.edu

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## Talks

- [1] Phenomenology 2017 Symposium, University of Pittsburgh, PA – *Exploring stau and multiparticle coannihilation regions and SUSY discovery at the LHC*
- [2] Phenomenology 2018 Symposium, University of Pittsburgh, PA – *Testing supergravity models with heavy scalars at the HL-LHC and HE-LHC and the gravitino decay constraints*
- [3] Workshop on the physics of HL-LHC, and perspectives at HE-LHC, CERN, Geneva, Switzerland **[INVITED Seminar]** – *HE-LHC vs. HL-LHC Potential for Supersymmetry Discovery*
- [4] APS April Meeting 2019: Quarks to Cosmos, Denver, CO – *Supersymmetry discovery potential at HL-LHC and HE-LHC*
- [5] 27th International Conference on Supersymmetry and Unification of Fundamental Interactions (SUSY2019), Corpus Christi, TX – *Detecting hidden sector dark matter at HL-LHC and HE-LHC via long-lived stau decays*
- [6] 2019 Meeting of the Division of Particles and Fields, Northeastern University, Boston, MA – *Mixed hidden sector-visible sector dark matter and observation of CP odd Higgs at the LHC*
- [7] 2019 Meeting of the Division of Particles and Fields, Northeastern University, Boston, MA – *Detecting hidden sector dark matter at HL-LHC and HE-LHC via long-lived stau decays*
- [8] Searching for long-lived particles at the LHC: Sixth workshop of the LHC LLP Community, University of Ghent, Belgium **[INVITED Seminar]** – *A long-lived stop with freeze-in and freeze-out dark matter in the hidden sector*
- [9] 28th International Conference on Supersymmetry and Unification of Fundamental Interactions (SUSY2021), Beijing, China – *Search for the low-lying SUSY spectrum at the LHC consistent with the recent muon  $g - 2$  result*
- [10] 10th International Conference on New Frontiers in Physics (ICNFP 2021), Crete, Greece – *A model of dark photons as dark matter in a multi-temperature universe*
- [11] APS April Meeting 2022: Quarks to Cosmos, New York City, NY – *A cosmologically consistent millicharged dark matter solution to the EDGES anomaly*

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- [12] HEP Seminar at Sungkyunkwan University, South Korea **[INVITED Seminar]** (April 3rd, 2024) – *The dynamics of the hidden dark sector in a Stueckelberg extension of the Standard Model*
- [13] Physics Colloquium at Hanover College, Hanover, IN **[INVITED]** (Jan 13, 2025) – *The dark photon as a portal to the dark sector: its production at the LHC and role in cosmological tensions*
- [14] Physics Colloquium at Adelphi University, Long Island, NY **[INVITED]** (Feb 26, 2025) – *The dark photon as a portal to the dark sector: its production at the LHC and role in cosmological tensions*
- [15] Physics Colloquium at University of Hartford, Hartford, CT **[INVITED]** (Mar 3, 2025) – *The dark photon as a portal to the dark sector: its production at the LHC and role in cosmological tensions*
- [16] Physics Colloquium at Swarthmore College, Swarthmore, PA **[INVITED]** (Mar 4, 2025) – *Particle physics at the intersection of the energy and cosmology frontiers*
- [17] Physics Colloquium at Hamilton College, Clinton, NY **[INVITED]** (Mar 11, 2025) – *The dark photon as a portal to the dark sector: its production at the LHC and role in cosmological tensions*

## List of Publications

- 2025 E. Di Valentino, J. Levi Said, A. Riess, A. Pollo, V. Poulin, A. Gómez-Valent, A. Weltman, A. Palmese, C. D. Huang and C. van de Bruck, *et al.*, The CosmoVerse White Paper: Addressing observational tensions in cosmology with systematics and fundamental physics, doi:10.1016/j.dark.2025.101965, [arXiv:2504.01669 [astro-ph.CO]]
- 2025 A. Aboubrahim and P. Nath, Cosmological tensions and  $Q_{\text{CDM}}$  as an alternative to  $\Lambda_{\text{CDM}}$  [arXiv:2503.09769 [astro-ph.CO]]
- 2024 A. Aboubrahim and P. Nath, Upper limits on dark energy-dark matter interaction from DESI DR2 in a field-theoretic analysis [arXiv:2411.11177 [astro-ph.CO]]
- 2024 A. Aboubrahim and P. Nath, Interacting ultralight dark matter and dark energy and fits to cosmological data in a field theory approach, JCAP **09**, 076 (2024) [arXiv:2406.19284 [astro-ph.CO]]
- 2023 A. Aboubrahim, M. Klasen and L. P. Wiggering, Forbidden dark matter annihilation into leptons with full collision terms, JCAP **08**, 075 (2023) [arXiv:2306.07753 [hep-ph]]
- 2022 A. Aboubrahim, M. M. Altakach, M. Klasen, P. Nath and Z. Y. Wang, Combined constraints on dark photons and discovery prospects at the LHC and the Forward Physics Facility, JHEP **03**, 182 (2023) [arXiv:2212.01268 [hep-ph]]
- 2022 P. J. Fox, G. D. Kribs, H. Murayama, A. Aboubrahim *et al*, TF08 Snowmass Report: BSM Model Building, arXiv:2210.03075 [hep-ph]
- 2022 F. Maltoni, S. Su, J. Thaler, T. K. Aarrestad, A. Aboubrahim *et al*, TF07 Snowmass Report: Theory of Collider Phenomena, arXiv:2210.02591 [hep-ph]

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- 2022 Tulika Bose, Antonio Boveia, Caterina Doglioni *et al*, Report of the Topical Group on Physics Beyond the Standard Model at Energy Frontier for Snowmass 2021, arXiv: 2209.13128 [hep-ph]
- 2022 Rana X. Adhikari, Luis A. Anchordoqui, Ke Fang *et al*, Report of the Topical Group on Cosmic Probes of Fundamental Physics for for Snowmass 2021, arXiv: 2209.11726 [hep-ph]
- 2022 A. Aboubrahim, L. Althueser, M. Klasen, P. Nath and C. Weinheimer, Annual modulation of event rate and electron recoil energy in inelastic scattering direct detection experiments, arXiv: 2207.08621 [hep-ph]
- 2022 A. Aboubrahim and P. Nath, A tower of hidden sectors: a general treatment and physics implications, JHEP **09** (2022) 084 [arXiv: 2205.07316 [hep-ph]]
- 2022 E. Abdalla, G. F. Abellán, A. Aboubrahim *et al*, Cosmology intertwined: A review of the particle physics, astrophysics, and cosmology associated with the cosmological tensions and anomalies, JHEAp **34** (2022) 49-211
- 2022 A. Aboubrahim, M. Klasen and P. Nath, Analyzing the Hubble tension through hidden sector dynamics in the early universe, JCAP **04** (2022) 04, 042
- 2021 A. Aboubrahim, M. Klasen, P. Nath and R. M. Syed, Tests of gluino-driven radiative breaking of the electroweak symmetry at the LHC, Phys. Scripta **97** (2022) 5, 054002
- 2021 A. Aboubrahim, P. Nath and Z. Y. Wang, A cosmologically consistent millicharged dark matter solution to the EDGES anomaly of possible string theory origin, JHEP **12** (2021) 148
- 2021 A. Aboubrahim, M. Klasen, P. Nath and R. M. Syed, Future searches for SUSY at the LHC post Fermilab  $(g - 2)_\mu$ , 2022 Snowmass Summer Study
- 2021 A. Aboubrahim, W. Z. Feng, P. Nath and Z. Y. Wang, Hidden sectors and a multi-temperature universe, 2022 Snowmass Summer Study
- 2021 A. Aboubrahim, P. Nath and R. M. Syed, Yukawa coupling unification in an SO(10) model consistent with Fermilab  $(g - 2)_\mu$  result, JHEP **06** (2021) 002
- 2021 A. Aboubrahim, M. Klasen and P. Nath, What the Fermilab muon  $g\tilde{L}\tilde{S}^2$  experiment tells us about discovering supersymmetry at high luminosity and high energy upgrades to the LHC, Phys. Rev. D **104** (2021) 3, 035039
- 2021 A. Aboubrahim, W. Z. Feng, P. Nath and Z. Y. Wang, A multi-temperature universe can allow a sub-MeV dark photon dark matter, JHEP **06** (2021) 086
- 2020 A. Aboubrahim, T. Ibrahim, M. Klasen and P. Nath, A decaying neutralino as dark matter and its gamma ray spectrum, Eur. Phys. J. C **81** (2021) 8, 680
- 2020 A. Aboubrahim, M. Klasen and P. Nath, Xenon-1T excess as a possible signal of a sub-GeV hidden sector dark matter, JHEP **02** (2021) 229
- 2020 A. Aboubrahim, W. Z. Feng, P. Nath and Z. Y. Wang, Self-interacting hidden sector dark matter, small scale galaxy structure anomalies, and a dark force, Phys. Rev. D **103** (2021)

- 2020 A. Aboubrahim, P. Nath and R. M. Syed, Corrections to Yukawa couplings from higher dimensional operators in a natural SUSY **SO(10)** and LHC implications, JHEP **01** (2021) 047, arXiv:2005.00867 [hep-ph]
- 2020 A. Aboubrahim, W. Z. Feng and P. Nath, Expanding the parameter space of natural supersymmetry, JHEP **04** (2020) 144, arXiv:2003.02267 [hep-ph]
- 2019 A. Aboubrahim, W. Z. Feng and P. Nath, A long-lived stop with freeze-in and freeze-out dark matter in the hidden sector, JHEP **02** (2020) 118, arXiv:1910.14092 [hep-ph]
- 2019 A. Aboubrahim and P. Nath, LHC phenomenology with hidden sector dark matter: a long-lived stau and heavy Higgs in an observable range, arXiv:1909.08684 [hep-ph]
- 2019 A. Aboubrahim and P. Nath, Mixed hidden sector-visible sector dark matter and observation of a CP odd Higgs boson at HL-LHC and HE-LHC, Phys. Rev. D **100**, 015042 (2019)
- 2019 A. Aboubrahim and P. Nath, Detecting hidden sector dark matter at HL-LHC and HE-LHC via long-lived stau decays, Phys. Rev. D **99**, 055037 (2019)
- 2019 M. Cepeda *et al.* (Physics of the HL-LHC Working Group), Higgs Physics at the HL-LHC and HE-LHC, arXiv:1902.00134 [hep-ph]
- 2018 X. Cid Vidal *et al.*, Beyond the Standard Model Physics at the HL-LHC and HE-LHC, arXiv:1812.07831 [hep-ph]
- 2018 A. Aboubrahim and P. Nath, Naturalness, the hyperbolic branch, and prospects for the observation of charged Higgs bosons at high luminosity LHC and 27 TeV LHC, Phys. Rev. D **98**, 095024 (2018)
- 2018 A. Aboubrahim, T. Ibrahim, A. Itani and P. Nath, Observables of low-lying supersymmetric vectorlike leptonic generations via loop corrections, Phys. Rev. D **98**, 075009 (2018)
- 2018 A. Aboubrahim and P. Nath, Supersymmetry at a 28 TeV hadron collider: HE-LHC, Phys. Rev. D **98**, 015009 (2018)
- 2017 A. Aboubrahim and P. Nath, Supergravity models with 50-100 TeV scalars, supersymmetry discovery at the LHC, and gravitino decay constraints, Phys. Rev. D **96**, 075015 (2017)
- 2017 A. Aboubrahim, P. Nath and A. B. Spisak, Stau coannihilation, compressed spectrum, and SUSY discovery potential at the LHC, Phys. Rev. D **95**, 115030 (2017)
- 2016 A. Aboubrahim, T. Ibrahim and P. Nath, Leptonic  $g-2$  moments, CP phases, and the Higgs boson mass constraint, Phys. Rev. D **94**, 015032 (2016)
- 2015 A. Aboubrahim, T. Ibrahim, P. Nath and A. Zorik, Chromoelectric dipole moments of quarks in MSSM extensions, Phys. Rev. D **92**, 035013 (2015)
- 2015 A. Aboubrahim, T. Ibrahim, and P. Nath, Neutron electric dipole moment and probe of PeV scale physics, Phys. Rev. D **91**, 095017 (2015)
- 2014 A. Aboubrahim, T. Ibrahim, and P. Nath, Probe of new physics using precision measurement of the electron magnetic moment, Phys. Rev. D **89**, 093016 (2014)
- 2014 A. Aboubrahim, T. Ibrahim, A. Itani and P. Nath, Large neutrino magnetic dipole moments in MSSM extensions, Phys. Rev. D **89**, 055009 (2014)

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2013 A. Aboubrahim, T. Ibrahim and P. Nath, Radiative decays of cosmic background neutrinos in extensions of the MSSM with a vectorlike lepton generation, Phys. Rev. D **88**, 013019 (2013)

## Outreach

2020-2022 Postdoc representative  
2018-2020 Graduate Student Ambassador

## Computer skills

Basic MATHEMATICA  
Intermediate ROOT, C, C++  
Advanced PYTHON, MATLAB, L<sup>A</sup>T<sub>E</sub>X, Bash

## Languages

Arabic	<b>Mothertongue</b>	
English	<b>Advanced</b>	<i>Con conversationally fluent</i>
French	<b>Basic</b>	<i>Understands basic written texts and conversations</i>

## Interests

- Cooking	- Table Tennis
- Volley Ball	- Swimming