MATHEUS HOSTERT

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ACADEMIC POSITIONS

Four-year Joint Post-Doctoral Position OCT. 2019 - PRESENT
Post-doctoral researcher at the Perimeter Institute and the University of Minnesota.

EDUCATION

Ph.D. in Theoretical Physics – Durham University, United Kingdom OCT. 2015 - SEP. 2019
Institute for Particle Physics Phenomenology (IPPP), Durham University.
Dissertation: Hidden Physics at the Neutrino Frontier: Tridents, Dark Forces, and Hidden Particles.
Supervisor: Prof. Silvia Pascoli. Dissertation Committee: Profs. David Cerdeño and Joachim Kopp.

Bachelors degree in Physics – Federal University of Santa Catarina, Brazil MAR. 2011 - JUN. 2015
Year abroad at Durham University (SEPT. 2013 - SEPT. 2014) with honors in advanced mathematics.

FELLOWSHIPS AND AWARDS

Science without Borders Ph.D. scholarship (SEPT. 2015): excellence-based Brazilian scholarship for a full Ph.D. abroad.

Science without Borders Undergraduate scholarship (SEPT. 2013): excellence-based Brazilian scholarship for one year of undergraduate studies abroad.

Research poster awards: Neutrino 2020, NuPhys 2018, and NuPhys 2017.

ACADEMIC ENGAGEMENT

EQUITY, DIVERSITY, AND INCLUSION EFFORTS

- Member of the Diversity & Inclusion Alliance of the College of Science and Engineering (CSE) at the University of Minnesota. Ensured that postdocs could provide feedback to the CSE Dean.

TRAINING AND RESEARCH PLACEMENTS

- **InvisiblesPLUS network**, 2019: one month at Nevis Laboratories, Columbia University, working with Prof. Georgia S. Karagiorgi and Dr. Mark Ross-Lonergan on MicroBooNE.
- **InvisiblesPLUS network**, 2019: one month at Lawrence Berkeley National Laboratory, point of contact: Prof. Christian Bauer.
- **InvisiblesPLUS network**, 2018: two-month placement at Fermilab, working with Dr. Pedro Machado.
- **Undergraduate research**, 2015: undergraduate research under the supervision of Profs. Débora P. Menezes and Marcus E. B. Pinto studying symmetry non-restoration in quantum field theory.
- **IPPP summer student**, 2014: undergraduate research on neutrino oscillations under the supervision of Prof. Silvia Pascoli.
- **Volunteer UG researcher**, 2013: volunteer undergraduate researcher under the supervision of Prof. Débora P. Menezes studying equations of state for stellar remnants.

EXPERIMENTAL COLLABORATIONS

- Working with the **MicroBooNE** collaboration under a memorandum of understanding to search for neutrino-induced e^+e^- events.
- Involved as a collaborator in future experimental projects, including DUNE and νSTORM.

TEACHING AND MENTORING

- **Student mentoring**: mentors three Ph.D. students in ongoing projects: Daniele Massaro and Jaime Hoefken at the University of Bologna, and Nicholas Kamp at MIT. Has mentored Dr. Asli Abdullahi and Nicolò Foppiani on several projects.
- **Summer Schools**, led a one-week project for high-school students at the International Summer School for Young Physicists (ISSYP) organized by the Perimeter Institute.
- **Graduate tutor**, 2016 to 2018: led 2nd-year physics students in problem classes on advanced classical mechanics and quantum theory.
- **Undergraduate tutor**, 2012 to 2013: invited tutor for university-wide program mentoring first-year students at Federal University of Santa Catarina (UFSC).

COMMUNITY ENGAGEMENT

- **Snowmass 2021**: Editor for the "neutrino frontier" whitepaper on sterile neutrinos and the "rare processes and precision measurements" whitepaper on new physics in kaon and hyperon factories. Made substantial contributions to 7 white papers and led a letter of intent with over 110 endorsers.
- **CERN FPC PBC**: a member of the Feebly Interacting Particle (FPC) working group, part of the Physics Beyond Colliders (PBC) effort at CERN. Currently building and maintaining a Python package that collects experimental limits on dark sectors.
- **Event organizer**: for the international workshop on Weak Interactions and Neutrinos (WIN) 2021 in Minnesota, US, and the Young Theorists Forums 9, 10, and 11 in Durham, UK. Convener for the IceDune workshop in 2021.

SCIENCE OUTREACH

- **KITP Teacher's Conference 2022**: keynote speaker at the KITP teacher's conference.
- **Celebrate Science 2018**: volunteer in regional outreach event for schools in County Durham.
- **Orkney Science Festival 2018**: volunteer in the International Orkney Science Festival, visiting schools in remote islands of the Orkney archipelago in the north of Scotland.
- **Royal Society Summer Exhibition 2017 and 2018**: event organizer for the "modeling the invisible" exhibition and volunteer at the "ghosts in the universe" exhibition on neutrinos.
- **Pint of Science 2017**: event manager for a local outreach event in County Durham.

PUBLICATIONS

The following is a selected list of publications for which I was one of the primary contributors. Author lists are displayed alphabetically, as is the standard in particle physics. A complete list can be found at inspirehep.net/authors/1621061.

Selected peer-reviewed publications

1. MicroBooNE and the e Interpretation of the MiniBooNE Low-Energy Excess, C. A. Argüelles, I. Esteban, M. Hostert, Kevin J. Kelly, J. Kopp, P. A. N. Machado, I. Martinez-Soler, Y. F. Perez-Gonzalez, Phys.Rev.Lett. 128 (2022) 24 241802, 2021, arXiv:2111.10359 [hep-ph], citations: **38**.
2. Heavy neutral leptons below the kaon mass at hodoscopic neutrino detectors, Carlos A. Argüelles, Nicolò Foppiani, Matheus Hostert, Phys.Rev.D 105 (2022) 9 095006, 2021, arXiv:2109.03831 [hep-ph], citations: **17**.

3. Novel multilepton signatures of dark sectors in light meson decays, Matheus Hostert, Maxim Pospelov, Phys.Rev.D 105 (2022) 1 015017, 2020, arXiv:2012.02142 [hep-ph], citations: **12**.
4. Constraints on decaying sterile neutrinos from solar antineutrinos, Matheus Hostert, Maxim Pospelov, Phys.Rev.D 104 (2021) 5 055031, 2020, arXiv:2008.11851 [hep-ph], citations: **15**.
5. A dark seesaw solution to low energy anomalies: MiniBooNE, the muon $(g-2)$, and BaBar, Asli Abdullahi, Matheus Hostert, Silvia Pascoli, Phys.Lett.B 820 (2021) 136531, 2020, arXiv:2007.11813 [hep-ph], citations: **45**.
6. Pair production of dark particles in meson decays, Matheus Hostert, Kunio Kaneta, Maxim Pospelov, Phys.Rev.D 102 (2020) 5 055016, 2020, arXiv:2005.07102 [hep-ph], citations: **15**.
7. Neutrino Masses from a Dark Neutrino Sector below the Electroweak Scale, Peter Ballett, Matheus Hostert, Silvia Pascoli, Phys.Rev.D 99 (2019) 9 091701, 2019, arXiv:1903.07590 [hep-ph], citations: **43**.
8. Dark Neutrinos and a Three Portal Connection to the Standard Model, Peter Ballett, Matheus Hostert, Silvia Pascoli, Phys.Rev.D 101 (2020) 11 115025, 2019, arXiv:1903.07589 [hep-ph], citations: **61**.
9. Z's in neutrino scattering at DUNE, Peter Ballett, Matheus Hostert, Silvia Pascoli, Yuber F. Perez-Gonzalez, Zahra Tabrizi, Renata Zukanovich Funchal, Phys.Rev.D 100 (2019) 5 055012, 2019, arXiv:1902.08579 [hep-ph], citations: **55**.
10. Neutrino trident production at near detectors, Matheus Hostert, PoS NOW2018 (2019) 037, 2019, citations: 1.
11. Testing New Physics Explanations of the MiniBooNE Anomaly at Neutrino Scattering Experiments, Carlos A. Argüelles, Matheus Hostert, Yu-Dai Tsai, Phys.Rev.Lett. 123 (2019) 26 261801, 2018, arXiv:1812.08768 [hep-ph], citations: **62**.
12. Neutrino Trident Scattering at Near Detectors, Peter Ballett, Matheus Hostert, Silvia Pascoli, Yuber F. Perez-Gonzalez, Zahra Tabrizi, Renata Zukanovich Funchal, JHEP 01 (2019) 119, 2018, arXiv:1807.10973 [hep-ph], citations: **45**.

Under review or non-peer reviewed publications

1. DarkNews: a Python-based event generator for heavy neutral lepton production in neutrino-nucleus scattering, Asli M. Abdullahi, Jaime Hoefken Zink, Matheus Hostert, Daniele Massaro, Silvia Pascoli, preprint, 2022, arXiv:2207.04137 [hep-ph].
2. Dipole-Coupled Neutrissimo Explanations of the MiniBooNE Excess Including Constraints from MINERvA Data, Nicholas W. Kamp, Matheus Hostert, Austin Schneider, Stefano Vergani, Carlos A. Argüelles, Janet M. Conrad, Michael H. Shaevitz, Melissa A. Uchida, preprint, 2022, arXiv:2206.07100 [hep-ph], citations: 2.
3. Efficiently Exploring Multi-Dimensional Parameter Spaces Beyond the Standard Model, Carlos A. Argüelles, Nicolò Foppiani, Matheus Hostert, preprint, 2022, arXiv:2205.12273 [hep-ph].
4. Dark sectors in neutron-shining-through-a-wall and nuclear absorption signals, Matheus Hostert, David McKeen, Maxim Pospelov, Nirmal Raj, preprint, 2022, arXiv:2201.02603 [hep-ph], citations: 6.
5. Hidden Physics at the Neutrino Frontier: Tridents, Dark Forces, and Hidden Particles, Matheus. Hostert, thesis, 2019.
6. Light Sterile Neutrinos at νSTORM: Decoherence and CP violation, Peter Ballett, Matheus Hostert, Silvia Pascoli, proceedings, 2017, arXiv:1705.09214 [hep-ph], citations: 1.

TALKS AND SEMINARS

A selected list of presentations at high-profile meetings is shown below. For a complete list, see mhostert.com/talks/.

Plenary talks

April 2019 — Prospects of Neutrino Physics, IPMU, Kashiwa, Japan

October 2019 — CERN Neutrino Platform Week 2019, CERN, Switzerland
December 2019 — NuPhys 2019, London, UK
November 2020 — Central American meeting of High Energy Physics, Cosmology and High Energy Astrophysics, Cidade da Guatemala, Central America
October 2020 — 3rd South American Dark Matter Workshop, ICTP, São Paulo, Brazil
March 2022 — KITP, Interdisciplinary Developments in Neutrino Physics, Santa Barbara, USA

Invited talks

June 2018 — Near detector workshop 2018, CERN, CERN, Switzerland
December 2018 — Physics Opportunities at the Near Detector of DUNE (PONDD), Fermilab, Fermilab, USA
May 2019 — Neutrino Theory Network Workshop, Washington U., St Louis, St Louis, USA
September 2020 — Snowmass Neutrino Frontier 03 kick-off meeting, USA
September 2020 — Snowmass Theory of neutrino physics mini-workshop, USA
October 2020 — Snowmass Baryon and Lepton Number Violating Processes workshop, USA
October 2020 — PIKIMO 9, Kentucky, Kentucky, USA
December 2020 — Snowmass Dark Sector Studies at High Intensities Frontier, USA
August 2021 — vSTORM collaboration meeting, CERN
September 2021 — UK Muon Collider and NuSTORM meeting, UK
October 2021 — Virginia Tech, neutrino seminar, Blacksbourgh, USA
June 2022 — Neutrino Theory Workshop, NuTs, Madrid, Spain
September 2022 — ICTP Program on New Directions in Particle Physics, São Paulo, Brazil

Invited parallel talks

May 2018 — Phenomenology Symposium 2018, Pittsburgh, USA
August 2018 — NuFact 2018, Virginia, Blacksbourg, USA
September 2018 — Neutrino Oscillation Workshop 2018, Ostuni, Italy
November 2021 — Brookhaven Forum 2021, Brookhaven National Laboratory, USA

Parallel talks

June 2019 — Invisibles Workshop 2019, Valencia, Valencia, Spain
May 2020 — Phenomenology Symposium 2020, Pittsburgh, Pittsburgh, USA
June 2020 — Neutrino 2020, University of Chicago, Chicago, USA
July 2020 — ICHEP 2020, Prague, Czech Republic
February 2021 — XIX International Workshop on Neutrino Telescopes, Italy
April 2021 — American Physics Society April Meeting, USA
July 2021 — American Physics Society Division of Particles and Fields meeting, USA
July 2022 — Snowmass 2022, Seattle, USA
August 2022 — TeVPA 2022, Kingston, Canada
September 2022 — CIPANP 2022, Orlando, USA

Invited seminars

May 2018 — Fermilab Theory Seminar, Fermilab, USA
June 2018 — Perimeter Institute, Waterloo, Canada
November 2018 — Max-Planck-Institut fur Kernphysik, Heidelberg, Heidelberg, Germany
March 2019 — Queen Mary University of London, London, UK
May 2019 — IFIC, Valencia, Valencia, Spain
August 2019 — MicroBooNE collaboration call, USA
August 2019 — Columbia University, New York, USA
February 2020 — Fermilab Theory Seminar, Fermilab, USA
May 2020 — Brookhaven Neutrino Theory Virtual Seminars, Brookhaven National Laboratory, USA
June 2020 — JGU Theorie Palaver, Mainz, Munich, Germany

March 2021 — Neutrino Seminar, Fermilab, Fermilab, USA
March 2021 — University of California Santa Cruz, Santa Cruz, USA
April 2021 — Carleton University, Carleton, Canada
April 2021 — C3P, UCLouvain, Louvain, Belgium
April 2021 — ETH, Zurich, Zurich, Switzerland
May 2021 — McGill University, Montreal, Canada
September 2021 — Perimeter Institute, particle physics seminar, Waterloo, Canada
November 2021 — Harvard University, family meeting, Boston, USA
December 2021 — SLAC, Stanford National Laboratory, USA
January 2022 — University of Kentucky, Kentucky, USA
February 2022 — TRIUMF/University of Victoria, Victoria, Canada
March 2022 — University of Toronto, Toronto, Canada
March 2022 — University of Texas A&M, College Station, USA