

MATHEUS HOSTERT

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ACADEMIC POSITIONS

Joint Post-Doctoral Position

OCT. 2019 - PRESENT

Researcher at the William I. Fine Theoretical Physics Institute, University of Minnesota, and the Perimeter Institute.

EDUCATION

PhD in Theoretical Physics – Durham University, United Kingdom

OCT. 2015 - SEP. 2019

Research at the Institute for Particle Physics Phenomenology (IPPP), Durham University.

Dissertation: *Hidden Physics at the Neutrino Frontier: Tridents, Dark Forces, and Hidden Particles*.

Dissertation Committee: Profs. David Cerd  o and Joachim Kopp.

Supervisor: Prof. Silvia Pascoli.

Bachelors degree in Physics – Federal University of Santa Catarina, Brazil

MAR. 2011 - JUN. 2015

Year abroad at Durham University (SEPT. 2013 - SEPT. 2014) and honors course on advanced mathematics.

FELLOWSHIPS AND AWARDS

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

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 Prof. Pedro Machado.
- **Undergraduate research**, 2015: undergraduate research under the supervision of Profs. D  bora 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. D  bora P. Menezes studying equations of state for stellar remnants.

EXPERIMENTAL COLLABORATIONS

- External **MicroBooNE** collaborator and one of the main analyzers in a search for neutrino-induced e^+e^- events.
- Member of collaborations for the future experimental projects DUNE, ν STORM, and IsoDAR.

TEACHING AND MENTORING

- **Student mentoring:** currently mentors three PhD students in on-going projects: Asli Abdullahi (Durham University), Daniele Massaro (Univeristy of Bologna), and Nicolò Foppiani (Harvard University).
- **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

- **Co-chair:** of the international workshop on Weak Interactions and Neutrinos (WIN) 2021.
- **Convener:** for the IceDune workshop.
- **Snowmass 2021:** main author of a letter of intent on “Opportunities and signatures of non-minimal Heavy Neutral Leptons” with over 110 endorsers.
- **Snowmass community paper editor:** for the sterile neutrino topic in the “neutrino frontier”, and for the topic of new physics searches at kaon and hyperon factories in the “rare processes and precision measurements” frontier.
- **Main local organizer:** for the Young Theorists Forums 9, 10, and 11, in the UK.

SCIENCE OUTREACH

- **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 local outreach event in County Durham.

PUBLICATIONS

The following is a selected list of publications for which I am the primary contributor. Author lists are displayed in alphabetical order, as is the standard in particle physics.

Peer-reviewed publications:

1. “*A Dark Seesaw Solution to Low Energy Anomalies: MiniBooNE, the muon ($g-2$), and BaBar*”, A. Abdullahi, M. Hostert and S. Pascoli, 2007.11813, Phys. Lett. B 820 136531 (2021).
2. “*Pair production of dark particles in meson decays*”, M. Hostert, K. Kaneta and M. Pospelov, 2005.07102, submitted to Phys.Rev.D 102 055016 (2020).
3. “*Dark Neutrinos and a Three Portal Connection to the Standard Model*”, P. Ballett, M. Hostert, S. Pascoli, 1903.07589, Phys.Rev.D 101 115025 (2020), **citations: 30**.
4. “*Neutrino Non-Standard Interactions: A Status Report*”, 1907.00991, *SciPost Phys.Proc.* 2 (2019) 001.
5. “*White Paper on New Opportunities at the Next-Generation Neutrino Experiments (Part 1: BSM Neutrino Physics and Dark Matter)*”, 1907.08311, Reports on Progress in Physics, Volume 83, Number 12.

6. “*Testing New Physics Explanations of MiniBooNE Anomaly at Neutrino Scattering Experiments*”, C. Argüelles, M. Hostert and Y. Tsai, 1812.08768, Phys.Rev.Lett. 123 (2019) no.26, 261801, **citations: 41**.
7. “*Neutrino Masses from a Dark Neutrino Sector below the Electroweak Scale*”, P. Ballett, M. Hostert and S. Pascoli, 1903.07590, Phys.Rev.D 99 (2019) 091701, **citations: 26**.
8. “*Z' in neutrino scattering at DUNE*”, P. Ballett, M. Hostert, S. Pascoli, Y. F. Perez-Gonzalez, Z. Tabrizi and R. Z. Funchal, 1902.08579, Phys.Rev.D 100 (2019) 055012, **citations: 33**.
9. “*Neutrino trident scattering at near detectors*”, P. Ballett, M. Hostert, S. Pascoli, Y. F. Perez-Gonzalez, Z. Tabrizi and R. Z. Funchal, arXiv:1807.10973, JHEP 1901 (2019) 119, **citations: 27**.

Preprints:

1. “*Novel multi-lepton signatures of dark sectors in light meson decays*”, M. Hostert and M. Pospelov, arXiv:2012.02142, to be submitted to Phys.Rev.D.
2. “*Constraints on Decaying Sterile Neutrinos from Solar Antineutrinos*”, M. Hostert and M. Pospelov, arXiv:2007.11813, submitted to Phys.Rev.D.

Non-peer reviewed publications

1. “*Feebly-Interacting Particles:FIPs 2020 Workshop Report*”, Agrawal, Prateek et al , arXiv:2102.12143.
2. “*Neutrino trident production at near detectors*”, M. Hostert, PoS (NOW2018) 037. Proceedings from Neutrino Oscillations Workshop 2018.
3. “*Light Sterile Neutrinos at ν STORM: Decoherence and CP violation*”, P. Ballett, M. Hostert and S. Pascoli, arXiv:1705.09214, NuPhys2016, ePrint Proceedings.

ACADEMIC PRESENTATIONS

The following is a selected list of presentations at high-profile meetings.

1. American Physics Society DPF meeting 2021 (USA): 05/21, contributed talk.
2. American Physics Society April Meeting (USA): 04/21, contributed talk at the largest physics meeting in the United States.
3. **Neutrino Seminar, Fermilab (USA): 03/21, invited seminar for leading national laboratory.**
4. 3rd South American Dark Matter Workshop (ICTP, Brazil): 10/20, contributed talk.
5. **CAHEP (Central America): 11/20, invited plenary talk.**
6. ICHEP 2020 (Prague, Czech Republic): 07/20, contributed poster and short talk at the at the largest international conference in high energy physics.
7. **Neutrino 2020 (USA): 06/20, award winning poster and short talk at the largest international conference in neutrino**
8. Phenomenology Symposium 2020 (USA): 05/20, invited contributed talk at the largest meeting of particle physics phenomenology in the United States.
9. Brookhaven Neutrino Theory Virtual Seminars (Brookhaven National Laboratory, USA): 05/20, invited talk.
10. **NuPhys 2019 (UK): 12/19, invited plenary talk.**
11. **CERN Neutrino Platform Week 2019: (CERN, Switzerland): 08/19, invited plenary talk.**
12. **Prospects of Neutrino Physics, IPMU (Japan): 04/19, invited plenary talk.**
13. **PONDD (FNAL, USA) (12/18): invited plenary talk.**
14. Neutrino Oscillation Workshop 2018 (Italy): 09/21, invited talk.
15. **Near detector workshop 2018 (CERN, Switzerland) (06/18): invited plenary talk.**