

# Curriculum Vitae

Teppei Katori

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## Current position

**2019-present** Reader (associate professor), King's College London

## Affiliation

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## Author and reviewer IDs

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Web of Science ID: S-8685-2019, <https://www.webofscience.com/wos/author/record/1363617>

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## Work experience

**2018-2019** Senior Lecturer, Queen Mary University of London

**2013-2018** Lecturer, Queen Mary University of London

**2009-2013** Postdoctoral Associate, Massachusetts Institute of Technology

## Education

**2002-2008** Ph.D. at Indiana University, Bloomington

**1998-2002** B.S. at Tokyo Institute of Technology

## Awards

- 2013** APS Henry Primakoff Award, “For outstanding contributions to a wide range of accelerator – based neutrino physics, including cross section measurements and searches for violations of Lorentz and CPT symmetry.”
- 2012** IUPAP C11 young scientist prize, “For his outstanding contributions to accelerator-based neutrino physics including a detailed measurement of the charged-current quasi-elastic scattering process with the MiniBooNE experiment and a search for possible Lorentz invariance violation.”
- 2008** William Koss memorial award for outstanding graduate research in physics
- 2005** COAS Graduate student travel grants

## Teaching Experience

- 2022/23** 4CCP1100, Physics Skills and Techniques, 6CCP9400, Relativistic High Energy Astrophysics
- 2021/22** 4CCP1100, Physics Skills and Techniques, 6CCP9400, Relativistic High Energy Astrophysics
- 2020/21** 4CCP1100, Physics Skills and Techniques, 6CCP9400, Relativistic High Energy Astrophysics
- 2018/19** SPA6309, Radiation detectors, SEF038, Introduction to Modern Physics
- 2017/18** SPA6309, Radiation detectors, SEF038, Introduction to Modern Physics
- 2016/17** SPA6309, Radiation detectors
- 2015/16** SPA6309, Radiation detectors, SPA5302, Nuclear Physics and Astrophysics
- 2014/15** SPA5302, Nuclear Physics and Astrophysics
- 2013/14** PHY-300, Synoptic Physics
- 2004** P221 Mechanics Physics Lab
- 2003** G530 Teaching in the U.S. Class Room, Tutor of Physics Forum
- 2002** P504 Practicum in Physics Laboratory Instruction, Tutor of Physics Forum

## Publications, Talks, and Posters

### Major contributed publications

1. R. Abbasi *et al.* [IceCube Collaboration], “Search for Quantum Gravity Using Astrophysical Neutrino Flavour with IceCube,” *Nature Physics* **18**, 1287–1292 (2022) [arXiv:2111.04654 [hep-ex]].
2. S. Samani *et al.*, “Pulse Shape Particle Identification by a Single Large Hemispherical Photo-Multiplier Tube,” *JINST* **15**, T05002 (2020) arXiv:1912.03901 [physics.ins-det].
3. K. Abe *et al.* [T2K Collaboration], “Constraint on the Matter-Antimatter Symmetry-Violating Phase in Neutrino Oscillations,” *Nature* **580**, 339–344 (2020) [ArXiv:1910.03887 [hep-ex]].
4. C. A. Argüelles, K. Farrag, T. Katori, R. Khandelwal, S. Mandalia and J. Salvado, “Sterile Neutrinos in Astrophysical Neutrino Flavor,” *JCAP* **02** (2020) 015 [arXiv:1909.05341 [hep-ph]].
5. K. Abe *et al.* [T2K Collaboration], “Search for neutral-current induced single photon production at the ND280 near detector in T2K,” *J. Phys. G* **46**, 08LT01 (2019) [arXiv:1902.03848 [hep-ex]].

6. M. Asrtsen *et al.* [IceCube Collaboration], “Neutrino Interferometry for High Precision Tests of Space-Time Symmetry with IceCube,” *Nature Physics* **14**, 961 (2018) [arXiv:1709.03434 [hep-ex]].
7. R. Acciarri *et al.* [MicroBooNE Collaboration], “Design and Construction of the MicroBooNE Detector,” *JINST* **12**, P02017 (2017) [arXiv:1612.05824 [physics.ins-det]].
8. C. A. Argüelles, T. Katori and J. Salvado, “New Physics in Astrophysical Neutrino Flavor,” *Phys. Rev. Lett.* **115**, 161303 (2015) arXiv:1506.02043 [hep-ph].
9. T. Katori and S. Mandalia, “PYTHIA hadronization process tuning in GENIE neutrino interaction generator,” *J. Phys. G***42**, 115004 (2015) arXiv:1412.4301 [hep-ex].
10. J. S. Díaz, T. Katori, J. Spitz and J. M. Conrad, “Search for neutrino-antineutrino oscillations with a reactor experiment,” *Phys. Lett. B* **727**, 412 (2013) [arXiv:1307.5789 [hep-ex]].
11. T. Brieze *et al.*, “Testing of Cryogenic Photo-multiplier Tubes for the MicroBooNE Experiment,” *JINST* **8**, T07005 (2013) [arXiv:1304.0821 [physics.ins-det]].
12. Y. Abe *et al.* [Double Chooz Collaboration], “First Test of Lorentz Violation with a Reactor-based Antineutrino Experiment,” *Phys. Rev. D* **86**, 112009 (2012) [arXiv:1209.5810 [hep-ex]].
13. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Test of Lorentz and CPT violation for short-baseline oscillation excesses,” *Phys. Lett. B* **718**, 1303 (2013) [arXiv:1109.3480 [hep-ex]].
14. L. Bugel *et al.*, “Demonstration of a Light-guide Detector for Liquid Argon TPCs,” *Nucl. Instrum. Meth. A* **640**, 69 (2011) [arXiv:1101.3013 [physics.ins-det]].
15. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “First Measurement of the Muon Neutrino Charged Current Quasielastic Double Differential Cross Section,” *Phys. Rev. D* **81**, 092005 (2010) [arXiv:1002.2680 [hep-ex]].
16. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Measurement of Muon Neutrino Quasi-Elastic Scattering on Carbon in MiniBooNE,” *Phys. Rev. Lett.* **100**, 032301 (2008) [arXiv:0706.0926 [hep-ex]].
17. T. Katori, V. A. Kostelecký and R. Tayloe, “Global three-parameter model for neutrino oscillations using Lorentz violation,” *Phys. Rev. D* **74**, 105009 (2006) [arXiv:hep-ph/0606154].
18. R. Tayloe *et al.*, “A large-volume detector capable of charged-particle tracking,” *Nucl. Instrum. Meth. A* **562**, 198 (2006).
19. L. B. Auerbach *et al.* [LSND Collaboration], “Tests of Lorentz violation in  $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  oscillations,” *Phys. Rev. D* **72**, 076004 (2005) [arXiv:hep-ex/0506067].

## Reviews and white papers

1. C. A. Argüelles *et al.* “Snowmass White Paper: Beyond the Standard Model effects on Neutrino Flavor,” *Eur. Phys. J. C* **83**, 15 (2023) [arXiv:2203.10811 [hep-ph]].
2. L. A. Ruso *et al.* “Theoretical tools for neutrino scattering: interplay between lattice QCD, EFTs, nuclear physics, phenomenology, and neutrino event generators,” [arXiv:2203.09030 [hep-ph]].
3. A. Addazi *et al.* “Quantum gravity phenomenology at the dawn of the multi-messenger era—A review,” *Prog. Part. Nucl. Phys.* **125** (2022), 103948 [arXiv:2111.05659 [hep-ph]].
4. C. A. Argüelles and T. Katori, “Lorentz Symmetry and High-Energy Neutrino Astronomy,” *Universe* **7** (2021) no.12, 490 [arXiv:2109.13973 [hep-ph]].
5. T. Katori, J. P. Yanez and T. Yuan, “Neutrino interaction physics in neutrino telescopes,” *Eur. Phys. J. ST* **230** (2021) no.24, 4293-4308 [arXiv:2109.04430 [hep-ex]].

6. L. Alvarez-Ruso *et al.*, “Snowmass 2021 LoI: Neutrino-induced Shallow- and Deep-Inelastic Scattering,” [arXiv:2009.04285 [hep-ex]].
7. M. Betancourt *et al.*, “Comparisons and Challenges of Modern Neutrino Scattering Experiments (TENSIONS2016 Report),” Phys.Rept. 773-774 (2018) 1-28, [arXiv:1805.07378 [hep-ex]].
8. L Alvarez-Ruso *et al.*, “NuSTEC White Paper: Status and Challenges of Neutrino-Nucleus Scattering,” Prog.Part.Nucl.Phys. 100 (2018) 1-68, [arXiv:1706.03621 [hep-ph]].
9. Teppei Katori and Marco Martini, “Neutrino-Nucleus interactions for oscillation experiments,” J. Phys. G. 45 (2017) 1, [arXiv:1611.07770 [nucl-th]].
10. Teppei Katori and Janet Conrad, “Beyond Standard Model Searches in the MiniBooNE experiment,” Adv.High Energy Phys. 2014 (2014) 362971 [arXiv:1404.7759 [hep-ex]].
11. Teppei Katori and Joe Grange, “Charged Current Quasi-Elastics Cross Section Measurement in Mini-BooNE,” Mod. Phys. Lett. A, Vol. 29, No. 12 (2014) 1430011 [arXiv:1404.6484 [hep-ex]].
12. Teppei Katori, “Tests of Lorentz Violation with Neutrinos,” Kouenerugii Nyuuusu (KEK News, Sep. 2012, Japanese-only).
13. Teppei Katori, “Tests of Lorentz and CPT violation with MiniBooNE neutrino oscillation excesses,” Mod. Phys. Lett. A, Vol. 27, No. 25 (2012) 1230024 [arXiv:1206.6915 [hep-ex]].

## Proceedings

1. Teppei Katori, Carlos A. Argüelles, and Kareem Farrag, “Search for quantum gravity using astrophysical neutrino flavour with IceCube,” Proceedings of the 38th International Cosmic Ray Conference (ICRC2023), PoS **ICRC2023**, 1225 (2023).
2. Teppei Katori, Carlos A. Argüelles, and Kareem Farrag, “New-Physics Constraints Derived From SME-Coefficient Limits Using IceCube Astrophysical Neutrino-Flavor Data,” prepared for the *9th Meeting on CPT and Lorentz Symmetry (CPT 22)*, Bloomington, Indiana, USA, May 17-26 2022, published in “CPT and Lorentz Symmetry”, Proceedings of the Ninth Meeting on CPT and Lorentz symmetry (R. Lehnert ed.), will be published from World Scientific (2023).
3. T. Katori [MiniBooNE], “MiniBooNE Neutrino Oscillation Search Results and Predicted Background Events,” prepared for the *3rd World Summit on Exploring the Dark Side of the Universe (EDSU2020)*, Guadeloupe Islands, March 9-13 2020, will be published from Proceedings of Science (PoS) [arXiv:2010.06015 [hep-ex]]
4. C. Andreopoulos *et al.* [NuSTEC], “Summary of the NuSTEC Workshop on Shallow- and Deep-Inelastic Scattering,” prepared for the *NuSTEC Workshop on Shallow- and Deep-Inelastic Scattering, GSSI, L’Aquila, Italy, 11-13, 2018*, [arXiv:1907.13252 [hep-ph]].
5. Teppei Katori, Carlos A. Argüelles, Kareem Farrag, and Shivesh Mandalia “Test of Lorentz Violation with Astrophysical Neutrino Flavor in IceCube,” prepared for the *8th Meeting on CPT and Lorentz Symmetry (CPT 19)*, Bloomington, Indiana, USA, Jun 17-21 2019, published in “CPT and Lorentz Symmetry”, Proceedings of the Eighth Meeting on CPT and Lorentz symmetry (R. Lehnert ed.), 166-169, World Scientific (2019). [arXiv:1906.09240 [hep-ph]]
6. Teppei Katori, Carlos A. Argüelles, and Jordi Salvado “Test of Lorentz Violation with Astrophysical Neutrino Flavor,” prepared for the *7th Meeting on CPT and Lorentz Symmetry (CPT 16)*, Bloomington, Indiana, USA, Jun 17-21 2016, published in “CPT and Lorentz Symmetry”, Proceedings of the Seventh Meeting on CPT and Lorentz symmetry (V. A. Kostelecký ed.), 209-212, World Scientific (2016). [arXiv:1607.08448 [hep-ph]]

7. T. Katori, P. Lasorak, S. Mandalia and R. Terri, “First look at the PYTHIA8 hadronization program for neutrino interaction generators,” prepared for the *Tenth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region (NuInt 15), Osaka, Japan, November 16-21, 2015*, will be published in “NuInt 2015”, Proceedings of Tenth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, JPS conference proceedings 12, 010033 (2016), [arXiv:1602.00083 [hep-ph]].
8. Teppei Katori and Shivesh Mandalia, “Hadronization processes in neutrino interactions”, prepared for the *NUFACT2014, Sixteenth International Workshop on Neutrino Factories and Future Neutrino Beam Facilities, University of Glasgow, Glasgow, UK, August 25-30, 2014*, published in “NUFACT 2014”, Proceedings of Sixteenth International Workshop on Neutrino Factories and Future Neutrino Beam Facilities, PoS NUFAC2014 (2015) 053, Proceedings of Science, SISSA (2015).
9. Teppei Katori and Shivesh Mandalia, “Hadronization processes in neutrino interactions”, prepared for the *Center for Theoretical Underground Physics and Related Areas (CETUP\*)-Workshop on Neutrino Interactions, Deadwood, SD, USA, July 21-31, 2014*, published in “CETUP\* 2014”, Proceedings of Workshop on Neutrino Interactions, Systematic Uncertainties and Near Detector Physics, AIP conference proceedings 1680, 020007, American Institute of Physics Publishing (2014), [arXiv:1412.4301v1 [hep-ex]].
10. Teppei Katori, “Short baseline neutrino oscillation experiments,” prepared for the *Prospects in Neutrino physics (NuPhys2013), London, UK, December 19-20 2013*, published in “NuPhys2013”, Proceedings of the first meeting (F. Di Lodovico and S. Pascoli ed.), Journal of Physics Conference Series 598 (2015) 1, 012006, Institute of Physics (2013). [arXiv:1404.6882 [hep-ph]].
11. Teppei Katori and Joshua Spitz, “Testing Lorentz Symmetry with the Double Chooz Experiment,” prepared for the *6th Meeting on CPT and Lorentz Symmetry (CPT 13), Bloomington, Indiana, USA, Jun 17-21 2013*, published in “CPT and Lorentz Symmetry”, Proceedings of the Sixth Meeting on CPT and Lorentz symmetry (V. A. Kostelecký ed.), 4-7, World Scientific (2013). [arXiv:1307.5805 [hep-ph]].
12. Teppei Katori [for the MicroBooNE Collaboration], “MicroBooNE Light Collection System,” prepared for the *Light Detection In Noble Elements (LIDINE2013), Fermilab, Batavia, IL, USA, May 29-31 2013*, published in “CPT and Lorentz Symmetry”, Proceedings of the First Light Detection In Noble Elements (S. Seibert ed.), JINST **8**, C10011 (2013) [arXiv:1307.5256 [physics.ins-det]].
13. Teppei Katori, “Meson Exchange Current (MEC) model in Neutrino Interaction Generator,” prepared for the *Eighth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region (NuInt 12), CBPF, Rio de Janeiro, Brazil, October 22-27, 2012* will be published in “NuInt 2012”, Proceedings of Eighth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, AIP conference proceedings 1663, 030001, American Institute of Physics Publishing (2013). [arXiv:1304.6014 [nucl-th]].
14. Teppei Katori, “MiniBooNE and SciBooNE experiments, and their cross section analysis,” prepared for the *Eighth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region (NuInt 12), CBPF, Rio de Janeiro, Brazil, October 22-27, 2012* will be published in “NuInt 2012”, Proceedings of Eighth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, AIP conference proceedings 1663, 020001, American Institute of Physics Publishing (2015). [arXiv:1304.5325 [hep-ex]].
15. Teppei Katori, “Test of Lorentz and CPT violation with Neutrinos,” prepared for the *36th International Conference on High Energy Physics (ICHEP2012), Melbourne, Australia, July 4-July 11, 2012*, published in “ICHEP2012”, Proceedings of 36th International Conference on High Energy Physics, Pos(ICHEP2012)008, IOP Publishing (2012). [arXiv:1211.7129 [hep-ph]].
16. Teppei Katori [for the MiniBooNE Collaboration], “Test of Lorentz and CPT violation with Neutrinos,” prepared for the *18th International Symposium on Particle Strings and Cosmology (PASCOS2012)*,

Merida, Mexico, Jun 3-Jun 8, 2012, published in “PASCOS2012”, Proceedings of 18th International Symposium on Particle Strings and Cosmology, IoPScience Journal of Physics: Conference Series, Vol. 486, 012041, IOP Publishing (2012).

17. Teppei Katori [for the MicroBooNE Collaboration], “MicroBooNE, A Liquid Argon Time Projection Chamber (LArTPC) Neutrino Experiment at Fermilab,” prepared for the *New Trends in High-Energy Physics (Crimea 2011), Alushta, Crimea, Ukraine, September 3-10, 2011* published in “Crimea 2011”, 118-126, Proceedings of New Trends in High-Energy Physics, Bogolyubov Institute for Theoretical Physics, National Academy of Sciences of Ukraine (2011).
18. Teppei Katori [for the MicroBooNE Collaboration], “SciBooNE, A Neutrino Cross Section Measurement Experiment at Fermilab,” prepared for the *New Trends in High-Energy Physics (Crimea 2011), Alushta, Crimea, Ukraine, September 3-10, 2011* published in “Crimea 2011”, 110-117, Proceedings of New Trends in High-Energy Physics, Bogolyubov Institute for Theoretical Physics, National Academy of Sciences of Ukraine (2011).
19. Teppei Katori [for the MiniBooNE Collaboration], “MiniBooNE, A Short Baseline Neutrino Oscillation Experiment at Fermilab,” prepared for the *New Trends in High-Energy Physics (Crimea 2011), Alushta, Crimea, Ukraine, September 3-10, 2011* published in “Crimea 2011”, 102-109, Proceedings of New Trends in High-Energy Physics, Bogolyubov Institute for Theoretical Physics, National Academy of Sciences of Ukraine (2011).
20. Teppei Katori [for the MicroBooNE Collaboration], “MicroBooNE, A Liquid Argon Time Projection Chamber (LArTPC) Neutrino Experiment,” prepared for the *Seventh International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region (NuInt 11), Dehradun, Uttarkhand, India, March 7-11, 2011* published in “NuInt 2011”, Proceedings of Seventh International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, AIP conference proceedings 1405, 250-255, American Institute of Physics Publishing (2011). [arXiv:1107.5112 [hep-ex]].
21. Teppei Katori [for the MiniBooNE Collaboration], “Test for Lorentz violation with the MiniBooNE low energy excess,” prepared for the *5th Meeting on CPT and Lorentz Symmetry (CPT 10), Bloomington, Indiana, Jun 28-Jul 2 2010*, published in “CPT and Lorentz Symmetry”, Proceedings of the Fifth Meeting on CPT and Lorentz symmetry (V. A. Kostelecký ed.), 70-74, World Scientific (2010). [arXiv:1008.0906 [hep-ex]].
22. Teppei Katori [for the MiniBooNE Collaboration], “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section,” prepared for the *XII Mexican Workshop on Particles and Field 2009, Mazatlan, Mexico, November 9-14, 2009* published in “XII Mexican Workshop on Particles and Field 2009”, Proceedings of 12th Mexican Workshop on Particles and Field, 356-360, American Institute of Physics Publishing.
23. Teppei Katori [for the MiniBooNE Collaboration], “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section,” prepared for the *11th International Workshop on Neutrino Factories, Superbeams and Beta Beams (NuFact 09), Illinois Institute of Technology, Chicago, IL, July 20-July 25, 2009* published in “NuFact 2009”, Proceedings of 11th International Workshop on Neutrino Factories, Superbeams and Beta Beams, AIP conference proceedings 1222, 471-474, American Institute of Physics Publishing (2010).
24. Teppei Katori [for the MiniBooNE Collaboration], “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section,” prepared for the *Sixth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region (NuInt 09), Sitges, Barcelona, Spain, May 18-May 22, 2009* published in “NuInt 2009”, Proceedings of Sixth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, AIP conference proceedings 1189, 139-144, American Institute of Physics Publishing (2009). [arXiv:0909.1996 [hep-ex]].
25. Teppei Katori, “Neutrino cross section measurements for long-baseline neutrino oscillation experiments,” prepared for *43rd Rencontres de Moriond “Electroweak interactions and Unified theories”, La*

*Thuile, Italy, March 1-8, 2008*, published in “2008 Electroweak Interactions and Unified Theories”, proceedings of the 43rd Rencontres de Moriond (Jean Tran Thanh Van et. al. ed.), 369-376, The Gioi publishers (2008). [arXiv:0805.2476 [hep-ex]].

26. T. Katori and R. Tayloe [for the MiniBooNE Collaboration], “A Search for Lorentz-Violating Neutrino Oscillations in MiniBooNE,” prepared for *4th Meeting on CPT and Lorentz Symmetry (CPT 07), Bloomington, Indiana, 8-11 Aug 2007*, published in “CPT and Lorentz Symmetry”, Proceedings of the Forth Meeting on CPT and Lorentz symmetry (V. A. Kostelecký ed.), 79-85, World Scientific (2008).
27. T. Katori and R. Tayloe [for the MiniBooNE Collaboration], “Test for Lorentz violation in the Mini-BooNE neutrino oscillation experiment,” prepared for the poster session of *4th Meeting on CPT and Lorentz Symmetry (CPT 07), Bloomington, Indiana, 8-11 Aug 2007*, published in “CPT and Lorentz Symmetry”, Proceedings of the Forth Meeting on CPT and Lorentz symmetry (V. A. Kostelecký ed.), 296-298, World Scientific (2008).
28. Teppei Katori [for the MiniBooNE Collaboration], “Charged-Current Interaction Measurements in MiniBooNE,” prepared for the *Fifth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region (NuInt 07), Fermilab, Batavia, IL, May 30-June 3, 2007* published in “NuInt 2007”, Proceedings of Fifth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, AIP conference proceedings 967, 123-129, Institute of Physics Publishing (2007). [arXiv:0709.4498 [hep-ex]].
29. Teppei Katori, V. Alan Kostelecký, and Rex Tayloe, “Global three-parameter model for neutrino oscillations using Lorentz violation,” prepared for the poster session of *Neutrino 06, Lensic Theater, Santa Fe, NM, June 13-19, 2006*, published in “Neutrino 2006”, Proceedings of Neutrino 2006, Nucl. Phys. Proc. Suppl. 221, (2011) 357.
30. T. Katori and R. Tayloe [for the LSND Collaboration], “Lorentz and CPT violation with LSND,” prepared for *3rd Meeting on CPT and Lorentz Symmetry (CPT 04), Bloomington, Indiana, 4-7 Aug 2004*, published in “CPT and Lorentz Symmetry”, Proceedings of the Third Meeting on CPT and Lorentz symmetry (V. A. Kostelecký ed.), 150-158, World Scientific (2005).

## Other selected publications

Full list of publications is available from <http://inspirehep.net/author/profile/T.Katori.1>

1. K. Abe *et al.* [T2K], Phys. Rev. D **103** (2021) no.11, 112009 doi:10.1103/PhysRevD.103.112009 [arXiv:2102.03346 [hep-ex]].
2. R. Abbasi *et al.* [IceCube], Phys. Rev. D **104** (2021), 022002 doi:10.1103/PhysRevD.104.022002 [arXiv:2011.03545 [astro-ph.HE]].
3. M. G. Aartsen *et al.* [IceCube-Gen2], J. Phys. G **48** (2021) no.6, 060501 doi:10.1088/1361-6471/abbd48 [arXiv:2008.04323 [astro-ph.HE]].
4. A. A. Aguilar-Arevalo *et al.* [MiniBooNE], Phys. Rev. D **103** (2021) no.5, 052002 doi:10.1103/PhysRevD.103.052002 [arXiv:2006.16883 [hep-ex]].
5. K. Abe *et al.* [T2K], JHEP **10** (2020), 114 doi:10.1007/JHEP10(2020)114 [arXiv:2002.11986 [hep-ex]].
6. K. Abe *et al.* [T2K], Phys. Rev. D **100**, no.11, 112009 (2019) doi:10.1103/PhysRevD.100.112009 [arXiv:1910.09439 [hep-ex]].
7. K. Abe *et al.* [T2K], Nature **580**, no.7803, 339-344 (2020) doi:10.1038/s41586-020-2177-0 [arXiv:1910.03887 [hep-ex]].
8. C. A. Argüelles, K. Farrag, T. Katori, R. Khandelwal, S. Mandalia and J. Salvado, JCAP **02**, 015 (2020) doi:10.1088/1475-7516/2020/02/015 [arXiv:1909.05341 [hep-ph]].

9. K. Abe *et al.* [T2K], Phys. Rev. D **101**, no.1, 012007 (2020) doi:10.1103/PhysRevD.101.012007 [arXiv:1909.03936 [hep-ex]].
10. K. Abe *et al.* [T2K], [arXiv:1908.10249 [hep-ex]].
11. K. Abe *et al.* [T2K and J-PARC Neutrino Facility Group], [arXiv:1908.05141 [physics.ins-det]].
12. C. Andreopoulos *et al.* [NuSTEC], [arXiv:1907.13252 [hep-ph]].
13. K. Abe *et al.* [T2K], doi:10.1093/ptep/ptz070 [arXiv:1904.09611 [hep-ex]].
14. K. Abe *et al.* [T2K], Phys. Rev. D **100**, no.5, 052006 (2019) doi:10.1103/PhysRevD.100.052006 [arXiv:1902.07598 [hep-ex]].
15. K. Abe *et al.* [T2K], Phys. Rev. D **99**, no.7, 071103 (2019) doi:10.1103/PhysRevD.99.071103 [arXiv:1902.06529 [hep-ex]].
16. K. Abe *et al.* [T2K], [arXiv:1901.03750 [physics.ins-det]].
17. K. Abe *et al.* [T2K], Phys. Rev. Lett. **121**, no.17, 171802 (2018) doi:10.1103/PhysRevLett.121.171802 [arXiv:1807.07891 [hep-ex]].
18. A. Aguilar-Arevalo *et al.* [MiniBooNE DM], Phys. Rev. D **98**, no.11, 112004 (2018) doi:10.1103/PhysRevD.98.112004 [arXiv:1807.06137 [hep-ex]].
19. A. Aguilar-Arevalo *et al.* [MiniBooNE], Phys. Rev. Lett. **121**, no.22, 221801 (2018) doi:10.1103/PhysRevLett.121.221801 [arXiv:1805.12028 [hep-ex]].
20. M. Betancourt *et al.*, Phys. Rept. **773-774**, 1-28 (2018) doi:10.1016/j.physrep.2018.08.003 [arXiv:1805.07378 [hep-ex]].
21. K. Abe *et al.* [Hyper-Kamiokande], [arXiv:1805.04163 [physics.ins-det]].
22. M. Aartsen *et al.* [IceCube], [arXiv:1803.05390 [physics.data-an]].
23. K. Abe *et al.* [T2K], Phys. Rev. D **98**, no.3, 032003 (2018) doi:10.1103/PhysRevD.98.032003 [arXiv:1802.05078 [hep-ex]].
24. M. Rominsky *et al.*, doi:10.2172/1418446
25. K. Abe *et al.* [T2K], Phys. Rev. D **98**, 012004 (2018) doi:10.1103/PhysRevD.98.012004 [arXiv:1801.05148 [hep-ex]].
26. A. Aguilar-Arevalo *et al.* [MiniBooNE], Phys. Rev. Lett. **120**, no.14, 141802 (2018) doi:10.1103/PhysRevLett.120.141802 [arXiv:1801.03848 [hep-ex]].
27. M. Aartsen *et al.* [IceCube], Nature Phys. **14**, no.9, 961-966 (2018) doi:10.1038/s41567-018-0172-2 [arXiv:1709.03434 [hep-ex]].
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## PhD thesis

“A Measurement of the muon neutrino charged current quasielastic interaction and a test of Lorentz violation with the MiniBooNE experiment”, under the supervision of prof. Rex Tayloe, FERMILAB-THESIS-2008-64

## Invited plenary talks in international conferences

1. “Overview of Neutrino-Nucleus Interaction Physics”, NuInt22, Hoam Faculty House, Seoul, Korea, Oct. 24, 2022
2. “New physics model constraints derived from SME coefficient limits using IceCube astrophysical neutrino flavour data”, 9th meeting on CPT and Lorentz Symmetry 2022 (CPT22), Bloomington, IN, online, May 23, 2022
3. “From Brave New Spacetime: Quantum Gravity”, APS April meeting, NYC, NY, USA, April 12, 2022
4. “Accelerator Short-Baseline Neutrino Anomalies”, Exploring Dark Side of the Universe (EDSU2020), University of the French West Indies, Guadeloupe Islands, March 12, 2020
5. “New Physics with Atmospheric Neutrinos”, PAHEN 2019, Humboldt-Universität zu Berlin, Berlin, Germany, September 27, 2019
6. “First Taste of Lorentz Violation with Neutrino Flavour in IceCube”, 8th meeting on CPT and Lorentz Symmetry 2019 (CPT19), Bloomington, IN, USA, May 16, 2019

7. “Physics of Neutrino Interactions around 1-10 GeV”, NDM 2018, Daejeon, South Korea, June 29, 2018
8. “Highlights from the NuSTEC-News 2015-2017”, NuInt17, The Fields Institute, Toronto, Canada, June 25, 2017
9. “New Physics in Astrophysical Neutrino Flavor”, 7th meeting on CPT and Lorentz Symmetry 2016 (CPT16), Bloomington, IN, USA, June 24, 2016
10. “PYTHIA Hadronization Program for Neutrino Experiments”, Neutrino-Nucleus Interaction 2015 (NuInt15), Osaka University, Osaka, Japan, November 20, 2015
11. “Physics of Neutrino Interactions”, Institute of Physics (IoP) annual meeting, University of Manchester, Manchester, UK, April 30, 2015
12. “Physics in MiniBooNE”, Interplay of Particle and Astroparticle Physics, Queen Mary University of London, London, UK, August 19, 2014
13. “MiniBooNE interaction systematics”, Neutrino-Nucleus Interactions 2014 (NuInt14), Surrey, UK, May 19, 2014
14. “Short Baseline Neutrino Experiments Present and Future”, Topical Research Meeting: Prospects in Neutrino Physics (NuPhys2013), Institute of Physics, London, UK, December 19, 2013
15. “Test of Lorentz and CPT Violation with Double Chooz Reactor Neutrino Oscillation Experiment”, 6th meeting on CPT and Lorentz Symmetry 2013 (CPT13), Bloomington, IN, USA, June 20, 2013
16. “MicroBooNE photon collection system”, Light Detection In Noble Elements 2013 (LIDINE2013), Fermilab, Batavia, IL, USA, May 31, 2013
17. “Tests of Lorentz and CPT violation with neutrino”, APS 2013 April meeting, Denver, CO, April 15, 2013
18. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, TRIUMF colloquium, TRIUMF, Vancouver, Canada, February 12, 2013
19. “MiniBooNE and SciBooNE experiments, and their cross section analyses”, Neutrino-Nucleus Interactions 2012 (NuInt12), CBPF, Rio de Janeiro, Brazil, October 22, 2012
20. “Meson exchange current (MEC) model in neutrino interaction generator”, Neutrino-Nucleus Interactions 2012 (NuInt12), CBPF, Rio de Janeiro, Brazil, October 22, 2012
21. “Test for Lorentz and CPT violation with Neutrinos”, 36th International Conference on High Energy Physics (ICHEP2012), Melbourne, Australia, July 10, 2012
22. “Test for Lorentz and CPT violation with Neutrinos”, 18th International Symposium on Particle Strings and Cosmology (PASCOS2012), Merida, Mexico, June 5, 2012
23. “Tests of Lorentz Invariance with Neutrinos”, NPAC forums, UW-Madison, Madison, WI, February 29, 2012
24. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, Wine and Cheese seminar, Fermilab, Batavia, IL, November 11, 2011
25. “MiniBooNE, A Neutrino Oscillation Experiment at Fermilab”, Physics and Astronomy colloquium, Tufts University, Boston, MA, September 30, 2011
26. “MicroBooNE, A Liquid Argon Time Projection Chamber (LArTPC) Neutrino Experiment at Fermilab”, New Trends in High Energy Physics 2011, Alushta, Crimea, Ukraine, September 9, 2011
27. “SciBooNE, A Neutrino Cross Section Measurement Experiment at Fermilab”, New Trends in High Energy Physics 2011, Alushta, Crimea, Ukraine, September 6, 2011

28. “MiniBooNE, A Neutrino Oscillation Experiment at Fermilab”, New Trends in High Energy Physics 2011, Alushta, Crimea, Ukraine, September 6, 2011
29. “US Liquid Argon Time Projection Chamber (LArTPC) experiments”, Neutrino-Nucleus Interactions 2011 (NuInt11), Dehradun, India, March 7, 2011
30. “Test for Lorentz Violation with the MiniBooNE Low Energy Excess”, 5th meeting on CPT and Lorentz Symmetry 2010 (CPT10), Bloomington, IN, USA, June 30, 2010
31. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, Elba Electron-Nucleus Scattering Workshop XI, Elba, Italy, June 23, 2010
32. “Test for Lorentz violation in the neutrino oscillation experiments”, Polskie Towarzystwo Fizyczne Oddzial Wroclaw, Seminarium Instytutow Fizyki U Wr, Wroclaw, Poland, November 27, 2009
33. “Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Cross Section in MiniBooNE”, XII Mexican Workshop on Particles and Field 2009, Mazatlan, Mexico, November 10, 2009
34. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, Neutrino-Nucleus Interactions 2009 (NuInt09), Sitges, Spain, May 19, 2009
35. “Neutrino cross section measurements for long-baseline neutrino oscillation experiments”, The 43rd Rencontres de Moriond “Electroweak interactions and Unified theories”, La Thuile, Italy, March 06, 2008
36. “The first result of MiniBooNE oscillation experiment”, Physics of Massive Neutrinos 2007 (PMN07), Blaubeuren, Germany, July 03, 2007
37. “Charged-Current Interaction Measurements in MiniBooNE”, Neutrino-Nucleus Interactions 2007 (NuInt07), Fermilab, Batavia, IL, June 31, 2007
38. “FINeSSE,  $\Delta$ s measurement through the Neutrino-Nucleon Neutral Current Scattering”, Pan Pacific spin 2005, Tokyo Institute of Technology, Tokyo, Japan, July 5, 2005

### Invited lecture contributions

1. “Test of Fundamental Physics with Neutrinos,” Corfu 2021 Workshop on the Standard Model and Beyond, online, Sep. 3, 2021
2. “Neutrino Interaction Physics,” Graduate school scummer lecture series, University of Nagoya, online, July 1 - 3, 2020
3. “STFC high energy physics graduate school,” Durham university, UK, September 1-13, 2019
4. “High-Energy Neutrino Astronomy,” 15th Recontres du Vietnam “Vietnam School on Neutrinos”, Quy Nhon, Vietnam, July 12 - 13, 2019
5. “Neutrino oscillation experiments”, Young Experimentalists and Theorists Institute (YETI2019), IPPP, Durham, UK, January 7, 2019
6. “STFC high energy physics graduate school,” Lancaster university, UK, September 2-14, 2018
7. “Neutrino Interaction Physics,” Graduate school scummer lecture series, Yokohama National University, Yokohama, Japan, July 30 - August 3, 2018
8. “Lorentz violation in Neutrino Physics (experiment),” 3rd IUCSS summer school on the Lorentz and CPT-violating Standard-Model Extension, Indiana University, Bloomington, online, June 20-21, 2018
9. “STFC high energy physics graduate school,” Lancaster university, UK, September 3-15, 2017.

10. “Physics of Neutrino Interactions around 1-10 GeV,” 30th neutrino workshop . *Physics of Neutrino Interaction*, IPMU, Kashiwa, Japan, February 4, 2017
11. “Physics of Neutrino Interactions around 1-10 GeV,” Two-body current contributions in neutrino-nucleus scattering, CEA Saclay, Saclay, France, April 11, 2016
12. “Neutrino Oscillation Experiments and Neutrino Interactions” NuSTEC school: International School for Neutrino Nucleus Scattering Physics, Okayama University, Okayama, Japan, November 11, 2015
13. “Lorentz violation in Neutrino Physics (experiment),” 2nd IUCSS summer school on the Lorentz and CPT-violating Standard-Model Extension, Indiana University, Bloomington, USA, June 12, 2015
14. “MiniBooNE QE scattering measurements, Neutrino cross section measurements”, Valencia Neutrino Interaction T2K meeting (VANISH2014), University of Valencia, Valencia, Spain, April 3-4, 2014
15. “Neutrino oscillation experiments”, Young Experimentalists and Theorists Institute (YETI2014), IPPP, Durham, UK, January 14, 2014
16. “Gas argon TPC (teaching assistant)”, EDIT2012 (Excellence in Detector and Instrumentation Technologies symposium, Fermilab, Feb.21-22, 2012

## Seminars

1. “Hyper-Kamiokande project,” HEP seminar, Columbia University, USA, April 13, 2022
2. “Nuclear Physics for Beyond the Standard Model Neutrino Physics,” ICN seminar, UNAM, online, Nov. 17, 2021
3. “Test of Lorentz and CPT violation with Neutrinos,” Nagoya University HEP seminar, online, July 8, 2020
4. “Constraint on the matter–antimatter symmetry-violating phase in neutrino oscillations,” Pabna Science and Technology University’s Physics Department’s webinar, online, June 24, 2020
5. “Constraint on the matter–antimatter symmetry-violating phase in neutrino oscillations,” Latin American Webinars on Physics seminar, online, April 22, 2020
6. “Neutrino Interactions Physics from MeV to PeV,” HEP seminar, Yokohama National University, Japan, August 9, 2019
7. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, University of Milano-Bicocca, Italy, May 23, 2019
8. “Neutrino-Nucleus Cross Sections for Oscillation experiments,” COHERENT collaboration seminar, Indiana University, Bloomington, May 10, 2019
9. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, DESY, Germany, April 24, 2019
10. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, University of Humburg, Germany, April 23, 2019
11. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, Lancaster University, UK, March 8, 2019
12. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, Royal Holloway University of London, UK, February 13, 2019
13. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” CERN seminar, CERN, Switzerland, February 5, 2019

14. “Neutrino Interferometry for High Precision Tests of Space-Time Symmetry,” HEP seminar, University of Sussex, UK, December 13, 2018
15. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, Imperial College London, UK, November 28, 2018
16. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” RAL seminar, Rutherford Appleton Lab, UK, November 23, 2018
17. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, Karlsruhe Institute of Technology, Germany, November 15, 2018
18. “Neutrino Interferometry for High Precision Tests of Space-Time Symmetry,” HEP seminar, University of Edinburgh, UK, November 9, 2018
19. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, University of Warwick, UK, November 1, 2018
20. “Physics of Neutrino Interactions around 1-10 GeV,” HEP seminar, Yokohama National University, Japan, August 3, 2018
21. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, Yokohama National University, Japan, July 31, 2018
22. “Neutrino Interferometry for High Precision Tests of Space-Time Symmetry,” ICRR seminar, Kamioka observatory, Japan, July 25, 2018
23. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, SungKyunKwan University (SKKU), UK, June 26, 2018
24. “Challenging of neutrino SIS/DIS interactions,” HEP seminar, Michigan State University, USA, June 19, 2018
25. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” HEP seminar, University College London (UCL), UK, June 14, 2018
26. “Neutrino Interferometry for High Precision Tests of Space-Time Symmetry with IceCube,” Cavendish HEP seminar, University of Cambridge, UK, May 1, 2018
27. “Physics of Neutrino Interactions around 1-10 GeV,” HEP seminar, University of Southampton, Southampton, UK, January 26, 2018
28. “Neutrino Interferometry for High Precision Tests of Space-Time Symmetry with IceCube,” HEP seminar, Yokohama National University, Japan, December 25, 2017
29. “Search for NC single photon production in T2K near detector”, Neutrino Physics Center (NPC) seminar, Fermilab, USA, June 1, 2017
30. “Test for Lorentz and CPT violation with neutrinos”, Astroparticle seminar, Fermilab, USA, May 22, 2017
31. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, King’s college London, Spain, March 15, 2017
32. “Physics of Neutrino Interactions around 1-10 GeV”, HEP seminar, University of Edinburgh, Edinburgh, UK, February 22, 2017
33. “Physics of Neutrino Interactions around 1-10 GeV”, HEP seminar, University of Bristol, Bristol, UK, November 30, 2016
34. “New Physics in Astrophysical Neutrino Flavors”, HEP seminar, University of Nottingham, Nottingham, UK, November 25, 2016



35. “New Physics in Astrophysical Neutrino Flavors”, HEP seminar, University of Rome “La Sapienza”, Rome, Italy, May 2, 2016
36. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, Instituto de Física Corpuscular (IFIC), Valencia, Spain, April 5, 2016
37. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, Lancaster University, Lancaster, UK, March 11, 2016
38. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, University of Oxford, Oxford, UK, March 1, 2016
39. “Neutrino Physics, Past, Present, and Future”, Louvain HEP seminar, University of Louvain, Louvain, Belgium, January 20, 2016
40. “Physics of Neutrino Interactions”, Nuclear physics seminar, University of Surrey, Surrey, UK, November 24, 2015
41. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, Chiba University, Chiba, Japan, June 9, 2015
42. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, University of Birmingham, Birmingham, UK, March 18, 2015
43. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, University of Sheffield, Sheffield, UK, February 19, 2015
44. “Test for Lorentz and CPT violation with neutrinos”, HEP seminar, University College London, London, UK, December 12, 2014
45. “Test for Lorentz and CPT violation with neutrinos”, Cavendish HEP seminar, University of Cambridge, Cambridge, UK, November 11, 2014
46. “Neutrino Physics, Past, Present, and Future”, Gent HEP seminar, University of Gent, Gent, Belgium, June 23, 2014
47. “Liquid Argon Detector R&D in USA”, Sussex HEP seminar, University of Sussex, Sussex, UK, March 6, 2014
48. “Liquid Argon Detector R&D in USA”, RAL HEP seminar, Rutherford Appleton Laboratory, Swindon, UK, February 19, 2014
49. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, HEP seminar, Queen Mary University of London, London, UK, October 25, 2013
50. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, HEP seminar, Royal Holloway University of London, London, UK, July 31, 2013
51. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, HEP seminar, Imperial College London, London, UK, March 14, 2013
52. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, ACP seminar, Kavli IPMU, Kashiwa, Japan, February 6, 2013
53. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, Penn State HEP/Astrophysics seminar, Pennsylvania State University, State College, PA, January 23, 2013
54. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, SMU HEP seminar, Southern Methodist University, Dallas, TX, September 24, 2012
55. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, HEP seminar, University of Toronto, Toronto, ON, Canada, April 10, 2012

56. “Test of Lorentz and CPT violation with neutrinos”, HEP seminar, University of Toronto, Toronto, ON, Canada, April 5, 2012
57. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, Harvard HEP seminar, Harvard University, Boston, MA, October 5, 2011
58. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, MIT lunch seminar, Massachusetts Institute of Technology, Boston, MA, September 29, 2011
59. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, U-Chicago HEP lunch seminar, University of Chicago, Chicago, IL, April 18, 2011
60. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, NU HEP seminar, Northwestern university, Evanston, IL, April 11, 2011
61. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, Glasgow HEP seminar, University of Glasgow, Glasgow, Scotland, March 21, 2011
62. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, BHU HEP seminar, Banaras Hindu University, Varanasi, India, March 17, 2011
63. “Analysis Techniques of Neutrino Cross Section Measurements in MiniBooNE”, PPD/Neutrino physics discussion seminar, Fermilab, Batavia, IL, November 5, 2010
64. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, HEP/Nuclear physics joint seminar, University of Maryland, College Park, MD, October 5, 2010
65. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, SMU HEP seminar, Southern Methodist University, Dallas, TX, September 27, 2010
66. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, NU HEP seminar, Northwestern university, Evanston, IL, September 20, 2010
67. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, U-Chicago HEP lunch seminar, University of Chicago, Chicago, IL, March 15, 2010
68. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, CU HEP seminar, Columbia University, New York City, NY, March 10, 2010
69. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, MIT lunch seminar, Massachusetts Institute of Technology, Boston, MA, March 9, 2010
70. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, Wroclaw neutrino group seminar, Wroclaw, Poland, November 30, 2009
71. “MiniBooNE, a neutrino experiment at Fermilab”, Wroclaw undergrad seminar, Wroclaw, Poland, November 26, 2009
72. “MiniBooNE, a neutrino experiment at Fermilab”, HEP group seminar, Waseda university, Tokyo, Japan, June 10, 2009
73. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, ICRR seminar, Kamioka observatory, Japan, June 8, 2009
74. “Test of Lorentz violation in the neutrino oscillation experiments”, KEK seminar, Tsukuba, Japan, June 5, 2009
75. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, J-PARC T2K group seminar, Tokai, Japan, June 3, 2009

76. “MiniBooNE, a neutrino experiment at Fermilab”, Spin and hadron group seminar, Tokyo Institute of Technology, Tokyo, Japan, June 1, 2009
77. “MiniBooNE, a neutrino experiment at Fermilab”, LPNHE seminar, Denis Diderot (Paris-VII) University, Paris, France, May 25, 2009
78. “A measurement of the muon neutrino charged current quasielastic (CCQE) interaction and a test of Lorentz violation with the MiniBooNE experiment”, PhD defense seminar, Bloomington, IN, December 10, 2008
79. “Measurement of muon neutrino charged current quasielastic (CCQE) scattering on carbon in MiniBooNE”, University of Wisconsin, Madison, WI, May 23, 2008
80. “Test for Lorentz and CPT violation using the neutrino oscillation”, Columbia University Particle seminar, New York, NY, September 19, 2007
81. “The first result of MiniBooNE oscillation experiment”, McGill University HEP seminar, Montreal, QC, Canada, May 09, 2007
82. “ $\Delta_s$ , Lorentz Violation and Neutrinos”, Kyoto University spin physics group seminar, Kyoto, Japan, July 12, 2005
83. “ $\Delta_s$ , Lorentz Violation and Neutrinos”, PhD candidacy seminar, Bloomington, IN, April 26, 2005

## Workshop contributions

1. “Test of Fundamental physics with Astrophysical Neutrinos”, Royal Society Yusuf Hamied Workshop for India and the UK, online, Feb. 24, 2023
2. “Neutrino Observatories”, UK HEP Forum, Cosener’s house, Abingdon, UK, Nov. 22, 2022
3. “Short-baseline reactor neutrino experiments,” Fundamental Physics Using Reactor (FPUR2022), Fukui, online, May 30, 2022
4. “Neutrino-induced Shallow- and Deep-Inelastic Scattering,” Neutrino–Nucleus Interactions in the Standard Model and Beyond, CERN, online, Jan. 17, 2022
5. “Lorentz Violation with Astrophysical Neutrino Flavor,” IUCSS workshop, Indiana University, Bloomington, USA, August 3, 2020
6. “Nuclear Physics for Beyond the Standard Model Neutrino Physics,” 2020 JPS annual meeting, Japan, March 18, 2020
7. “Neutrons in T2K and IceCube,” IoP workshop “Neutron Physics in Neutrino Astronomy”, King’s College London, London, November 8, 2019
8. “MiniBooNE anomaly and nuclear physics,” European Center of Theoretical Nuclear physics and related topics (ECT\*), Trento, Italy, April 15, 2019
9. “Observation of a Significant Excess of Electron-Like Events in the MiniBooNE Short-Baseline Neutrino Experiment,” NExT workshop, Queen Mary University of London, London, April 3, 2019
10. “Neutrino interferometry to study fundamental physics,” Workshop on the Phenomenology of Dark Matter Searches with Quantum Sensors, King’s College London, UK, March 6, 2019
11. “Challenging of neutrino SIS/DIS interactions,” NuSTEC workshop on Neutrino Shallow- and Deep-Inelastic Scattering, L’Aquila, Italy, October 13, 2018
12. “Physics of Neutrino Interactions around 1-10 GeV,” HEP workshop on nucleon structure and QCD, Tokyo Institute of Technology, Japan, July 30, 2018

13. “Challenging of neutrino SIS/DIS interactions,” European Center of Theoretical Nuclear physics and related topics (ECT\*), Trento, Italy, July 10, 2018
14. “Physics for Accelerator-based Neutrino Oscillation experiments”, European Center of Theoretical Nuclear physics and related topics (ECT\*), Trento, Italy, Apr. 27, 2018
15. “Experimental Challenges of Beam-based Neutrino Physic around 1-10 GeV,” UK input to European strategy, IPPP Durham, Apr. 17, 2018
16. “Neutrino Interferometry for High Precision Tests of Space-Time Symmetry with IceCube,” NExT physics meeting, Royal Holloway University of London, Nov. 1, 2017
17. “SIS and DIS neutrino interactions”, IPPP-NuSTEC workshop, IPPP, Durham, April 18, 2017
18. “Physics of Neutrino Interactions since INT2013,” INT workshop 16-63W, Institute of Nuclear Theory, University of Washington, WA, USA, December 8, 2016
19. “Tests of Lorentz and CPT violation with neutrinos,” Nu-exotic workshop, University of Lancaster, Lancaster, UK, December 5, 2016
20. “Physics of Neutrino Interactions around 1-10 GeV”, KM3NeT-HyperK mPMT workshop, NIKHEF, Amsterdam, Germany, July 14, 2016
21. “Single photo production in neutrino experiments,” ALPs workshop, Institute of particle physics and phenomenology (IPPP), Durham, UK, April 14, 2016
22. “Physics of Neutrino Interactions around 1-100 GeV,” Atmospheric Neutrino Workshop (ANW’16), University of Munich, Munich, Germany, February 8, 2016
23. “Physics of Neutrino Interactions around 1-10 GeV,” MANTS (ANTARES, Baikal, KM3NeT, IceCube), University of Amsterdam, Amsterdam, Netherlands, October 18, 2015
24. “Nucleon correlations in neutrino oscillation experiments”, International Workshop on Experimental and Theoretical Topics in CLAS Data Mining, MIT, MA, USA, August 09, 2014
25. “Hadronization model in neutrino oscillation physics”, Center for Theoretical Underground Physics and Related Areas (CETUP\*), Lead, SD, USA, July 28, 2014
26. “Importance of high angle measurements (for experimentalists) and low momentum transfer (for theorists)”, INT workshop INT-13-54W, Institute of Nuclear Theory, University of Washington, Seattle, USA, December 12, 2013
27. “Neutral Current Single Gamma Production, Current Experiments”, INT workshop 13-54W, Institute of Nuclear Theory, University of Washington, Seattle, USA, December 11, 2013
28. “Lorentz violation in Neutrinos ”, NExT meeting on BSM physics in light of LHC, Planck results and  $\theta_{13}$  discovery, Southampton, UK, November 27, 2013
29. “MicroBooNE neutrino cross section measurements”, Neutrino Nucleus Generators, PITTPACC, Pittsburgh, PA, June 9, 2013
30. “MicroBooNE photon detection system”, LArTPC R&D workshop, Fermilab, Batavia, March 20, 2013
31. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, Short talk for Queen Mary University of London, London, UK, March 12, 2013
32. “Research plan”, Short talk for Excellence Cluster (phone), Munich, Germany, February 6, 2013
33. “Test of Lorentz and CPT violation with MiniBooNE excesses”, LVNU’12, IUCSS, Bloomington, IN, March 11, 2012

34. “Neutrino signals with SME”, SME workshop, IUCSS, Bloomington, IN, August 13, 2011
35. “Test of Lorentz and CPT Violation”, GSA lecture series, Fermilab, Batavia, IL, June 9, 2011
36. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, Short-Baseline Neutrino Workshop (SBNW11), Fermilab, Batavia, IL, May 13, 2011
37. “Test of Lorentz violation in the neutrino oscillation experiments”, ICRR lecture series, Kashiwa, Japan, June 26, 2009
38. “MiniBooNE CCQE analysis”, Saclay T2K group, Saclay, France, May 27, 2009
39. “The neutrino interaction measurements in MiniBooNE experiment”, Physics of Massive Neutrinos (PMN) 2007, Blaubeuren, Germany, July 03, 2007
40. “ $\Delta s$  measurement through the neutrino neutral current elastic scattering”, International School of Physics “Enrico Fermi” course 167, Varenna, Italy, June 29, 2007
41. “MiniBooNE, a neutrino oscillation search at Fermilab”, National Nuclear Physics Summer School (NNPSS) 2006, Bloomington, IN, July 28, 2006

### Parallel session talks

1. “Search for quantum gravity using astrophysical neutrino flavour with IceCube,” Scientific Committee on Antarctic Research (SCAR), online, August, 2022
2. “Search of Quantum Gravity with High-Energy Astrophysical Neutrino Flavour,” (in Japanese) JPS annual meeting, online, March 15, 2021
3. “Neutrino Interferometry for New Physics Search,” IoP APP-HEPP annual meeting, Imperial College London, April 4, 2019
4. “Neutrino Interferometry for High Precision Tests of Space-Time Symmetry with IceCube,” IoP APP-HEPP annual meeting, University of Bristol, Mar. 26, 2018
5. “Search for Accelerator-Produced sub-GeV Dark Matter Particles in MiniBooNE”, IDM2016, University of Sheffield, Sheffield, UK, July 18, 2016
6. “Hadronization processes in neutrino interactions for oscillation physics,” QCD@LHC 2015, Queen Mary University of London, London, UK, September 2, 2015
7. “Hadronization model in neutrino oscillation physics,” NuFact 2014, University of Glasgow, Glasgow, Scotland, UK, August 27, 2014
8. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, Phenomenology Symposium (PHENO) 2011, Madison, WI, May 9, 2011
9. “Global Lorentz Violation Model for Neutrino Oscillation with MiniBooNE”, Phenomenology Symposium (PHENO) 2008, Madison, WI, April 28, 2008
10. “SciBooNE experiment, the neutrino cross section measurement”, Division of Nuclear Physics (DNP) 2007 Meeting, Newport News, VA, October 13, 2007
11. “Charged-Current Interaction Measurements in MiniBooNE”, Division of Nuclear Physics (DNP) 2007 Meeting, Newport News, VA, October 13, 2007
12. “Charged-current cross section measurements in MiniBooNE”, Division of Nuclear Physics (DNP) 2006 Meeting, Nashville, TN, October 26, 2006
13. “Global 3 parameter model for neutrino oscillations with Lorentz Violation”, Division of Nuclear Physics (DNP) 2006 Meeting, Nashville, TN, October 26, 2006

14. “FINeSSE,  $\Delta s$  measurement through neutrino scattering”, Division of Nuclear Physics (DNP) 2005 Meeting, Maui, HI, September 21, 2005
15. “Search for Lorentz Violation in LSND”, Division of Nuclear Physics (DNP) 2005 Meeting, Maui, HI, September 22, 2005
16. “FINeSSE, prototype beam test”, Division of Nuclear Physics (DNP) 2004 Meeting, Chicago, IL, October 29, 2004

## Posters

1. “Highlights from HESE-7.5yr @ IceCube”, Cherenkov Telescope Array UK Science Meeting (online), June 21, 2021
2. “New Physics in Astrophysical Neutrino Flavor”, Topical Research Meeting: Prospects in Neutrino Physics (NuPhys 2018), Cavendish Conference Centre, London, December 20, 2018
3. “Search for NC gamma at T2K near detector”, NuInt17, The Fields Institute, Toronto, Canada, June 27, 2017
4. “New Physics in Astrophysical Neutrino Flavor”, 27th International Conference on Neutrino Physics and Astrophysics (Neutrino 2016), Imperial College London, London, July 5, 2016
5. “Atmospheric-Neutrino Flux-Integrated Differential Cross-Section Measurement in IceCube”, Topical Research Meeting: Prospects in Neutrino Physics (NuPhys 2015), Barbican centre, London, December 16, 2015
6. “New Physics in Astrophysical Neutrino Flavor”, Topical Research Meeting: Prospects in Neutrino Physics (NuPhys 2015), Barbican centre, London, December 16, 2015
7. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, 11th International Workshop on Neutrino Factories, Superbeams and Beta Beams (NuFact 09), Illinois Institute of Technology, Chicago, IL, July 22, 2009
8. “Charged-Current Quasi-Elastic (CCQE) Interaction Measurements in MiniBooNE”, NSF site visit at Indiana University Cyclotron Facility, IUCF, Bloomington, IN, December 5, 2007
9. “Test for Lorentz violation in the MiniBooNE Experiment”, Fourth Meeting on CPT and Lorentz Symmetry Neutrino 2007, Bloomington, IN, August 9, 2007
10. “Global three parameter model for Neutrino Oscillations using Lorentz Violation”, Neutrino 2006, Lencic Theater, Santa Fe, NM, June 15, 2006
11. “A look inside the particle identification of MiniBooNE”, DOE site visit at Fermi National Accelerator Laboratory, Fermilab, Batavia, IL, August, 2006
12. “Test of Lorentz Violation with LSND”, Fermilab’s Graduate Student Association (GSA) New Perspectives 2006, Fermilab, Batavia, IL, May 31, 2006
13. “FINeSSE, Fine-grained Intense Neutrino Scintillator Scattering Experiment”, NSF site visit at Indiana University Cyclotron Facility, IUCF, Bloomington, IN, November 17, 2004
14. “FINeSSE, prototype detector beam test”, Fermilab’s Graduate Student Association (GSA) New Perspectives 2004, Fermilab, Batavia, IL, June 4, 2004
15. “FINeSSE, a neutrino scattering experiment”, Neutrino 2004, College de France, Paris, France, June 13-19, 2004 (absence from the poster session)

## Outreach

1. “Neutrinos: Exploring Origin of Matter and Universe,” Maxwell Lecture, King’s College London, London, November 15, 2022
2. “Particle Shrine,” Science Gallery London, London, <https://christosquier.co.uk/Particle-Shrine>, October, 2022,
3. “Subatomic,” Britten Pears Arts Summer Festival, Snape Maltings, Suffolk, <https://christosquier.co.uk/Subatomic>, September 11, 2021,
4. “Neutrinos: Exploring Origin of Matter and Universe,” IOP West Midlands branch webinar, April 20, 2021
5. “Neutrino Astronomy and Beyond,” Cumberland lodge (online), February 23, 2021
6. “Neutrinos: Exploring Origin of Matter and Space-time,” King Edward VI Grammar School, February 27, 2020
7. “Dark Matter Hunters,” Dark Day at King’s College London, King’s College London, October 31, 2019
8. “Neutrino Physics,” Lecture series for IoP retired members, Institute of Physics, UK, July 4, 2019
9. “Search of Quantum Gravity with Neutrinos: Hawking’s Unfulfilled Dream,” Pint of Science, The Horseshoe,, May 21, 2019
10. “Tests of Lorentz violation with neutrinos,” School of Physics and Astronomy public lecture series, Queen Mary University of London, Sep. 27, 2018
11. “Neutrino physics,” UCAS talk, Queen Mary University of London, Mar. 10, 2018
12. “Tests of Lorentz violation with neutrinos,” PsiStar lecture series, Queen Mary University of London, Feb. 1, 2018
13. “MiniBooNE-DM, Search for Accelerator-produced sub-GeV Dark Matter Particles,” Dark Matter Day event, Queen Mary University of London, October 31, 2017
14. “Search of Space-Time Defect:The Race to Defeat Einstein”, Pint of Science, The Water Poet, May 18, 2015
15. “PhD in USA”, Story Collider, The Book Club, London, March 25, 2015
16. “Neutrino physics”, University and Colleges Admissions Service (UCAS) talk, Queen Mary University of London, London, February 12, 2014
17. “Masterclass video conference, meet the featured scientist”, Masterclass video conference, Fermilab, Batavia, IL, March 22, 2013
18. “Tape: A Celebration”, an art show at Chicago Art Department, 1932 S. Halsted st. #100, Chicago, IL, August 12, 2011
19. “Neutrino, Ghost Particle of the Atom”, State of the Arts Chicago, Truman College, Chicago, IL, May 2, 2011
20. “Hard Science”, an art show at Chicago Art Department, 1837 S. Halsted st., Chicago, IL, August 27, 2010
21. “Video meeting with Japanese students from Kyoto university, how to apply US graduate school?”, Fermilab, Batavia, IL, August 2, 2010
22. “Meeting with Super-Science High school (SSH) students from Japan”, QuarkNet Fermilab program, Fermilab, Batavia, IL, July 12, 2010

23. “Video conference to discuss Masterclass LEP/DELPHI data and LHC events”, QuarkNet Fermilab Masterclass, Fermilab, Batavia, IL, February 23, 2010
24. “Meeting with Super-Science High school (SSH) students from Japan”, QuarkNet Fermilab program, Fermilab, Batavia, IL, October 10, 2009
25. “An introduction of Japan for 3rd grade students”, Cicero public schools board of education district 99, Cicero, IL, May 12, 2009
26. “An introduction of Japan for 3rd grade students”, Cicero public schools board of education district 99, Cicero, IL, April 27, 2009

## Students, interns

### PhD

1. Archie Millsop, 2023- , King’s College London
2. Nahid Bhuiyan, 2021- , King’s College London
3. Rogan Clark, 2020- , King’s College London
4. Joanna Gao, 2020- , King’s College London
5. Kareem Farrag, 2017-2022, Queen Mary University of London
6. Shivesh Mandalia, 2015-2019, Queen Mary University of London
7. Pierre Lasorak, 2014-2018, Queen Mary University of London

### Masters

- 2022/23 Alexandra Kravchenko, Daniel Harvey, King’s College London
- 2021/22 Cam Rose, Binjie Zou, Epseeta Chowdhury, Leith-Alexander Harb, King’s College London
- 2020/21 Jay Odedra, King’s College London
- 2019/20 Maitrayee Mandal, Carlo Palazzi, King’s College London
- 2018/29 Miho Wakai, King’s College London
- 2018/19 John Garrood, Soniya Samani, Alex Wantling, Queen Mary University of London
- 2016/17 Tobias Barton, Liam Hartley, Jesal Mandalia, Shivanath Shivananda, Carl Stanley, Queen Mary University of London
- 2014/15 Givanni Bernardi, Shivesh Mandalia, Queen Mary University of London

### Summer interns

- 2023 James Cole (funded by King’s College London)
- 2022 Sara Fekri, Angus Thompson (funded by King’s College London)
- 2021 Ahlam Abdi, Dipanjan Mitra, Anastasia Soldatova (funded by King’s College London), Beatrice Crudele (funded by Nuclear Security Science Network)
- 2020 George Burton, Julio Figueroa Quintana (funded by King’s College London)
- 2018 Yahui Li, Zhenxiong Xie, Sun Yat-sen University, P. R. China (funded by SYSU)



2016 Rishi Moulard, University of Cambridge (funded by the Ogden Trust), Carl Stanley, Queen Mary University of London (funded by Queen Mary University of London)

2015 Afrida Alam, Leicester University (funded by the Ogden Trust), Sara McCarney, King's College London (funded by the Ogden Trust), Rishi Moulard, University of Cambridge (funded by the Ogden Trust)

2014 Ryan Hill, Queen Mary University of London (funded by Queen Mary University of London)

## Membership

1. Member of Institute of Physics, Astro Particle Physics (APP), High Energy Particle Physics (HEPP), and Nuclear Physics (NP)
2. Member of American Physical Society, Division of Astrophysics (DAP), Division of Nuclear Physics (DNP), and Division of Particles and Fields (DPF)

## Collaborations

1. Super-Kamiokande collaboration
2. NuSTEC collaboration
3. IceCube-Gen2 collaboration
4. Hyper-Kamiokande collaboration
5. T2K collaboration
6. SciBooNE collaboration
7. MiniBooNE collaboration

past MicroBooNE collaboration, DUNE collaboration

## Service work

I have reviewed number of grants, both large scale project grants (Belgium, Brazil, Chile) and fellowships (Belgium, Italy, Netherlands, UK). I have refereed number of journals, including NIMA, JphysG, NPB, EPJC, PRD, and PRL. The full list is available from Web of Science (<https://www.webofscience.com/wos/author/record/1363617>).

**2022-** T2K public website committee chair

**2021-** Hyper-Kamiokande publication board member

**2021-** Hyper-Kamiokande institute board member

**2020-** T2K public website committee member

**2019-23** IoP astro particle physics (APP) committee chair

**2018-22** IoP high energy particle physics (HEPP) committee member

**2014-** IoP astro particle physics (APP) committee member

**2013-** NuSTEC board member

**2013-** NuSTEC News main editor

**2012-2013** MicroBooNE experiment cross section working group convener

**2009-2013** MicroBooNE experiment active detector working group convener

**2013** 2013 APS Henry Primakoff award selection committee

**2010** MiniBooNE experiment CCQE/NCEL group convener

**2007** SciBooNE experiment shift coordinator

**2006-2007** MiniBooNE experiment shift coordinator

## Organization contributions

2023 IoP APP-HEPP annual conference, organizing committee chair

2019 NuPhys 2019, organizing committee. IoP workshop on neutron physics in astroparticle physics, organizer chair. King's College International Dark Matter Day event, organizer chair. ECT\* workshop, "Atomic nuclei as laboratories for BSM physics", organizing committee chair

2018 NuPhys 2018, organizer committee. Queen Mary International Dark Matter Day event, organizer chair. NuInt18 organizer committee. NuSTEC workshop on neutrino shallow- and deep-inelastic scattering, organizer chair. IoP workshop on Supernova neutrino physics, organizer committee

2017 Queen Mary International Dark Matter Day event, organizer chair. NuSTEC school 2017 organizer committee member. IoP workshop on new physics with astrophysical neutrinos, organizer committee

2015 Neutrino Interaction Physics in UK, organizer chair

2014 NuSTEC school 2014 organizer committee member. NuInt 2014 QE session organizer. NuInt 2014 local organizer committee member. Physics in South Pole, organizer chair

2013 INT workshop (INT-13-54W) NC gamma session organizer. Accelerator-based neutrino physics session convener, IPA 2013, UW-Madison, Madison, WI, May 13-15, 2013. Photon detection session convener, LArTPC R&D Workshop, Fermilab, Batavia, IL, Mar. 20-21, 2013

## Research

**2022** I am an active collaborator on T2K, Super-Kamiokande, Hyper-Kamiokande, IceCube, and NuSTEC. In T2K, I continued to serve as the public website committee chair. In the SuperK, Joanna made an online page of the OD charge and time contains monitoring page. Nahid started to work on atmospheric tau neutrino appearance analysis using neutron signals. In Hyper-K, Joanna started to reconstruct events using the PointNet algorithm, and she found that machine learning was over 1000 times faster than the traditional likelihood approach. I continued to serve on the 3 committees, mPMT reviewer, HyperK publication board, and far detector (FD) safety committee. The neutron-water cross-section measurement beam test plan was underway at the ISIS ChipIr beamline. We got 2 new collaborators, Durham (Dr. Patrick Stowell) and Okayama (Prof. Koshio). In IceCube, I and Rogan started to investigate the new medium energy starting event (MESE) sample to look for the flavour ratio. In particular, we were building a new starting track PID based to measure tau neutrinos. In NuSTEC, I maintain the mailing list and website. The Snowmass21 activities were concluded. The white paper I was an editor of was published (EPJC83, 15 (2023)). The other white papers I contributed were also available on ArXiv (2203.07323, 2203.09030, 2203.11110). I continued my research on water-based quantum dots radiation detectors.

**2021** I am an active collaborator on T2K, Super-Kamiokande, Hyper-Kamiokande, IceCube, and NuSTEC. In T2K, I became the T2K public website committee chair, and I led the renewal of the webpage including updating all articles and transferring some of the data to Zenodo. In Super-Kamiokande, I was working with Joanna on taking over some of the outer detector (OD) calibration tasks, including charge calibration and time calibration constant monitoring. Nahid Bhuiyan joined the SuperK, and

he investigated the Geant4 version of the SuperK simulation. In Hyper-K, I started 3 committee jobs, mPMT reviewer, HyperK publication board, and far detector (FD) safety committee. I and Joanna joined the WachMaL (Water Cherenkov Machine Learning) collaboration, and Joanna was investigating the PointNet algorithm to reconstruct events in HyperK. I started a new collaboration with Dr. Carlo Cazzaniga (ISIS Neutron and Muon Source) to measure neutron-water cross-sections to improve physics in SuperK and HyperK. For this, Nahid started to study neutron flux measurements at the ChipIr beamline at the ISIS. In IceCube, Kareem’s analysis was published in Nature Physics (Nature Physics 18, pages 1287–1292 (2022)). I and Rogan analysed the all 10-yr data of DMIce to recalibrate the detector. We found the atmospheric muon seasonal oscillation agreed with the prediction, however, the complication of the ice model made it difficult to use these data to calibrate the IceCube detector. In NuSTEC, I maintain the mailing list and website, and I joined the outreach committee. This year, I also started to receive an R&D grant to investigate quantum dots as an alternative water-based liquid scintillator. We purchased quantum dots, and summer students made a water solution of this. We made an initial cosmic ray test and measured the radiation response at our lab. The Snowmass21 activities continued, and I started to contribute several white papers, especially I was working on as an editor of a white paper “Beyond the Standard Model effects on Neutrino Flavor”.

**2020** I am an active collaborator on T2K, Super-Kamiokande, Hyper-Kamiokande, IceCube, and NuSTEC. In T2K, I took over the task to maintain the T2K website server and lead editor of the T2K website. In this year, I officially joined the Super-Kamiokande collaboration. I and my student Joanna Gao joined the calibration group, and we are looking for Michel electrons in outer-detector (OD) region. This would give a new opportunity to calibrate OD region signals, and moreover this may give important input for the HyperK OD design. In Hyper-K, I participate OD working group activities. On top of this, I maintain King’s College London lab. The goal is to facilitate the test benches for key measurements including prototype outer-detector PMTs, and characterize wave-length shifting plates and Tyvek reflectors. In IceCube, on top of BSM group activities, I and my student Rogan Clark joined the calibration group, and we are looking for signals in DMIce scintillators. 2 of small scintillators are located bottoms of 2 strings, and coincidences of them and ICeCube DOMs, or IceTops, can be used to calibrate track events. Meantime, Kareem Farrag is finishing up his analysis using the HESE-7.5 flavor ratio, which is expected to be the most sensitive tool to look for dimension-6 vacuum operator. In NuSTEC, I maintain mailing list and website. The Snowmass21 process has been started, and I am involved in this in 3 ways. First, as a NuSTEC board member, I wrote a LoI on SIS physics, this is the topic I organized a workshop in 2018. Second, as a IceCube BSM group member, I wrote a LoI on new physics search using astrophysical neutrino flavors. Finally, I also joined to help conveners to summarize exotic oscillation LoIs submitted to the Neutrino Frontier.

**2019** I am an active collaborator on T2K, IceCube-Gen2, and NuSTEC. In T2K, we published the result of NC single gamma search in J Phys G letter section (J.Phys.G46 08LT01 (2019)). Meantime, I involved in the publication of the latest oscillation result. Here, statistics of T2K first time reached to the point where  $3\sigma$  contour of  $\delta_{CP}$  is closed. I wrote the abstract of this paper and facilitated other issues specific to the Nature journals. The result was published in Nature (Nature 580, 339-344 (2020)). In IceCube, Kareem and Carlos Argüelles (MIT) led a paper to look for sterile neutrinos from astrophysical neutrino flavor data in IceCube using 4-dimensional Haar measure. The paper was published on JCAP (JCAP 02 (2020) 015). Kareem is working on IceCube fulltime now. He is mainly working on the global fit of HESE cascade sample and through going high-energy muon sample. Master student, Soniya Samani did data analysis of the DOM beam test paper which we collected the data in 2017. Although data show saturation and after pulse, we manage to extract pulse shape information from the width of the primary pulse, and we concluded the electromagnetic Cherenkov radiation has a thicker pulse than the MIP Cherenkov radiation, as we expected. The result was published in JINST (JINST15(2020)T05002).

**2018** I was an active collaborator on T2K, IceCube-Gen2, and NuSTEC. In T2K, with a PhD student Pierre Lasorak, we made the first limit on NC single gamma search below 1 GeV. On top of that, we made the first T2K analysis oscillation search including the near detector  $\nu_e$  sample. Pierre successfully defended his PhD by this work and graduated. On IceCube, I and PhD student Shivesh Mandalia are working

on a new physics search from the flavor data of high energy starting event (HESE) sample. We model new physics in terms of effective operators, and we set the first limits of new physics from the HESE 7.5-year flavor ratio data and the paper is under preparation. This work is done by a collaboration with DESY (Juliana Stachurska), MIT (Carlos Argüelles), Sungkyunkwan University (Hrvoje Dujmovic), UW-Madison (Austin Schneider, Nancy Wandkowsky, Tianlu Yuan). Kareem Farrag is a new joint student between Queen Mary and Southampton. He started to work on IceCube projects. He is working on the improvement of HESE analysis software. As a NuSTEC collaborator, I organized the workshop on SIS (shallow inelastic scattering) physics workshop at GSSI, L'Aquila, Italy.

- 2017** I was an active collaborator on T2K and IceCube-Gen2. In T2K, with a Ph.D. student Pierre Lasorak, we continued to work on the search of single gamma in FGD. The technote was published and we will soon start to write the journal publication. Pierre was also contributing to oscillation analysis, by making it utilizing  $\nu_e$  sample from the near detector. The machinery is almost ready for the next round oscillation analysis (2018). On IceCube, I and Ph.D. student Shivesh Mandalia contributed to the low energy oscillation program in several ways. First, Shivesh worked on improving the PISA oscillation code. Second, we are working on constructing low energy neutrino interaction errors for IceCube, including both DIS and hadronization errors. We also worked on the search of Lorentz violation from the atmospheric neutrino sample, collaborating with MIT (Carlos Argüelles, Gabriel Collin, Janet Conrad) and UW-Madison (Ali Kheirandish). The paper was published in Nature Physics (Nature Physics 14, 962 (2018)).
- 2016** I was an active collaborator on T2K and IceCube-Gen2. In T2K, with a PhD student Pierre Lasorak, we continued to work on the search of single gamma in FGD. Along with this work, Pierre implemented a new near detector simulation method, where a single channel of NEUT can be interfaced, so that rare processes (including single gamma production) can be simulated more effectively. This was the first such effort to look for rare events, new particles, and new physics in T2K near detector. Pierre continued to work on the implementation of the single gamma channel on GENIE. He was also contributing oscillation analysis, by making it utilizing  $\nu_e$  sample from the near detector, where Queen Mary (Pierre Lasorak and Sophie King) has lots of expertise. On IceCube, I and PhD student Shivesh Mandalia worked on mainly low energy physics. Shivesh developed a code to calculate flux-integrated triple differential cross-section and he improved the oscillation code used to look for neutrino mass ordering. I also initiated 2 new analyses in IceCube. One is the new effort to look for Lorentz violation, with Carlos Argüelles and Gabriel Collin (MIT). The other analysis is the high energy neutrino cross-section measurement with Carlos and Logan Wille (University of Wisconsin, Madison).
- 2015** I was an active collaborator on T2K and IceCube-Gen2. In T2K, with a PhD student Pierre Lasorak, we estimated the first limit on neutral current single gamma (NC1gamma) production cross-section from the FGD detector in T2K ND280. We also worked on implementing state-of-the-art NC1gamma model in GENIE. For HyperK, we studied the gadolinium neutron capture process. In IceCube, with a new PhD student Shivesh Mandalia, we investigated one of the IceCube reconstructions to study low energy atmospheric neutrinos. We also investigated possible tuning PYTHIA hadronization program for neutrino interaction in GENIE, and this work with Mandalia was published (J. Phys. G **42**, 115004 (2015)). Meantime, I started a new theory collaboration with Carlos Argüelles (MIT) and Jordi Salvado (Valencia). We introduced effective operators to represent any new physics in astrophysical neutrino flavor content, to study possible flavor effect can be observed by neutrino telescopes such as IceCube. This work was published (Phys. Rev. Lett. **115**, 161303 (2015)). As a NuSTEC collaboration, I continue to publish the neutrino cross-section newsletter. MicroBooNE detector paper (I contributed photon detection system) was finally published (arXiv:1612.05824)
- 2014** I was an active collaborator on T2K and MiniBooNE. From this year, I joined 2 new experiments, Hyper-Kamiokande in Japan, and IceCube at the South pole, and 2 contributions, NuSTEC collaboration, and GENIE contributor. In T2K, I continued to work on NCGamma analysis. For HyperK, we submitted LoI to both the UK and Japan, where we proposed a new near detector called TITUS. TITUS is a gadolinium-doped water tank, to tag neutrons to distinguish events otherwise identical topologies. We investigated LAPPD (large area pico-second photo-detector) as a candidate detector for TITUS, and for this reason, we also joined ANNIE collaboration led by the University of Chicago.

In IceCube, I studied the atmospheric neutrino differential cross-section measurement. As a NuSTEC collaboration, I participated to organize the first NuSTEC school, at Fermilab. I continued to publish the neutrino cross-section newsletter. For GENIE, I worked in the hadronization group, we are investigating the possible improvement of the hadronization model to our energy region. The result was presented at CETUP\* workshop.

**2013** Until this year, I was an active collaborator on the MiniBooNE, MicroBooNE, SciBooNE, and LBNE. For MiniBooNE, I remained as an on-site member. I was a reviewer of the muon antineutrino CCQE double cross-section measurement analysis. The paper was published in this year ( (Phys. Rev. D **88**, 032001 (2013)). For MicroBooNE, I am a convener for cross-section working group and active detector working group. I am working on the preparation of the installation of the PMT system. The detail of the PMT test I perform in the last years was presented at the LArTPC R&D workshop at Fermilab, and it was later published (JINST8(2013)T07005 (JINST **8**, T07005 (2013))). The detail of the PMT system was presented at the LIDINE 2013. I work on the spectrum fit of Double Chooz experiment public data to search Lorentz violation. The result is later published (Phys. Rev. D **86**, 112009 (2012)). I accepted a new position at the Queen Mary University of London. From this year, I joined a new experiment, Tokai to Kamioka (T2K) experiment in Japan. In T2K, I worked on the neutral current single photon production (NCGamma) analysis. I also worked on electromagnetic calorimeter (ECal), which is the UK group responsible device. On top of this, I submitted the proposal to obtain IceCube associate membership. From this year, I started “Neutrino Cross-Section Newsletter”, to encourage students to read more papers.

**2012** I was an active collaborator on the MiniBooNE, MicroBooNE, SciBooNE, and LBNE. For MiniBooNE, I remained as an on-site member, and I am contributing by taking shifts. For MicroBooNE, I started to contribute as a convener for cross-section working group. I was also a convener for the active detector working group for the PMT system. I worked on all aspects of the PMT system, including PMTs and bases, cables, feed-through, splitter board, HV unit, wave-length shifter, PMT mount, and PMT rack. I tested all PMTs in nitrogen, and I am preparing a paper on that. We took data with two MicroBooNE in Bo cryostat at PAB, Fermilab. PMTs were immersed in liquid argon, and prototype electronics are equipped. For SciBooNE, I served as a convener of  $\bar{\nu}_m u$  disappearance paper. The paper was published (Phys. Rev. D **86**, 052009 (2012)). I also worked on the Lorentz Violation analysis on the Double Chooz experiment. The preliminary result was presented at ICHEP2012, Australia. The result was later published (Phys. Rev. D **86**, 112009 (2012)). I also started to contribute to the GENIE neutrino generator. My contribution is 2 aspects; the first one was to establish a multi-nucleon emission model with arbitrary neutrino cross-section models, and the second one was to compare the world electron scattering data with new cross models in GENIE. This work was presented at NuInt12, Brazil.

**2011** I was an active collaborator on the MiniBooNE, MicroBooNE, SciBooNE, and long-baseline neutrino experiment (LBNE). For MiniBooNE, I continued to serve as a reviewer of anti-neutrino mode CCQE analysis, and the result was published (Phys. Rev. **D84** 072005 (2011)). The analysis of Lorentz violation was completed, and the paper was published (Phys. Lett. B **718**, 1303 (2013)). This was presented at many places, including the Fermilab wine and cheese seminar (Nov. 11). For MicroBooNE, I continued to work on the PMT system. By using the PMT test stand developed last year, I tested all MicroBooNE PMTs with room temperature, and I started to test them in liquid nitrogen. For SciBooNE, I served as an on-site expert. I also represented all of three experiments, MiniBooNE, MicroBooNE, and SciBooNE, and gave overall talks at New Trends of High Energy Physics 2011, Crimea, Ukraine. For LBNE, I worked on R&D detector of the Liquid Argon scintillation detection system. We tested bis-MSB embedded polystyrene scintillation bar by vacuum spectrometer. Since bi-MSB is cheaper than TPB, if its VUV response is reasonable, we can develop a large detector array based on bis-MSB, not TPB. We also tested bis-MSB coated greenhouses to see the enhancement of the growth of plants.

**2010** I was an active collaborator on the MiniBooNE, MicroBooNE, and SciBooNE experiments. For MiniBooNE, a recently published paper was presented at an electron scattering conference at Elba '10, Italy. I worked on a new MiniBooNE analysis, testing the oscillation signal for Lorentz and CPT

violation. Since MiniBooNE has unexplained low energy oscillation candidate events, it was interesting to test exotic theories, such as Lorentz violation for an explanation for these events. The preliminary result was presented at CPT '10 at Bloomington, Indiana. I also served as a reviewer of anti-muon neutrino charged current quasi-elastic (CCQE) analysis. For MicroBooNE, I continued to work on all aspects of the MicroBooNE experiment's PMT system. I worked on the setup of the PMT test stand. We designed the light injection system, high voltage (HV) feed-through with custom Argon gas breakdown protection, and 8-inch PMT (x4) fixture for large open Dewar test stand. The designed bases were installed to all PMTs, and we were planning to test all 30 PMTs in liquid nitrogen in the next year. Meantime, we studied TPB coated acrylic plate. We measured its emission by a spectrometer. We also measured attenuation and transmission. Finally, we measured the response from the vacuum ultraviolet (VUV) light source by vacuum spectrometer. The plate was tested in material test cryostat "LUKE", to measure outgas rate and oxygen contamination. The TPB coated acrylic plate was found not a major source to reduce electron lifetime in the liquid Argon. I also designed a base schematics for a test PMT at MIT (R7725mod), and the measurement of the TPB coated light guide with liquid Argon was published (Nucl. Instrum. Meth. A **640**, 69 (2011)). For SciBooNE, I continue to serve as an on-site expert for detector maintenance.

**2009** I was an active collaborator for the MiniBooNE, MicroBooNE, and SciBooNE experiments. For MiniBooNE, I continued to work on the CCQE analysis. I presented my thesis result at NuInt '09 at Sitges, Spain. After presenting, I worked on final analysis checks and the result was published (Phys. Rev. D **81**, 092005 (2010)). Starting in 2009, I started working as a postdoctoral associate at the Massachusetts Institute of Technology. I began work with the MicroBooNE experiment, which is a liquid Argon TPC detector, featuring a PMT array for event triggering. I was charged as a convener of the PMT group and I worked on all aspects of the PMT system, including hardware, software, and management. Since the PMTs will sit in a bath of liquid Argon, the PMT bases have to be made from special passive components. I designed the PMT base scheme and tested all passive components, PMT bases, and PMTs in liquid nitrogen with simple electronics. Since the TPC requires high purity liquid Argon, I also tested the purity of liquid Argon with PMT materials. The goal of the PMT system is to detect the scintillation light interactions inside the liquid Argon. Since this light is UV (128nm), special wave-length shifter (WLS) is required to detect this light by the bi-alkali photo-cathode on the PMT. We studied WLS in terms of coating, mixture, and yield. We decided to use the tetraphenyl butadiene (TPB). I also worked on the readout simulation of MicroBooNE's TPC signal. For SciBooNE, I served as an on-site expert for detector maintenance.

**2008** I mainly worked on the MiniBooNE experiment at Fermilab but I was also on an active SciBooNE collaborator. For MiniBooNE, I worked on 2 topics: a  $\nu_\mu$ CCQE double differential cross section measurement and a test of Lorentz violation for MiniBooNE. Since the double differential cross section completely specifies the kinematics of  $\nu_\mu$ CCQE, this measurement will provide valuable information in understanding  $\nu_\mu$ CCQE kinematics for neutrino scattering energy reconstruction, and this is one of the critical topics for the success of future long baseline oscillation experiments. For the second topic, I worked with 2 different aspects of Lorentz violating neutrino oscillation model; one is the test of a sidereal variation of MiniBooNE low energy excess, and the other is understanding of MiniBooNE low energy excess energy dependence in terms of our model which we developed in 2006. I graduated from Indiana University in December 2008.

**2007** I worked on 2 experiments at Fermilab: SciBar Booster Neutrino Experiment (SciBooNE) and MiniBooNE. For SciBooNE, I was charged with the operation of the high voltage system and the online environmental monitoring system. We successfully installed the high voltage system for both the Scintillation bar (SciBar) detector and Muon Range Detector (MRD). We also equipped various transducers to monitor electric rack temperatures and detector hall humidities, and their online status as monitored from the SciBooNE main control room. I also worked on the assembly of the MRD. For MiniBooNE, I continued to work on the  $\nu_\mu$ CCQE analysis. I performed a grid search to find the best fit values of the  $\nu_\mu$ CCQE kinematics parameters in our Monte Carlo to describe the data. A paper on this work (Phys. Rev. Lett. **100**, 032301 (2008)) was presented at NuInt '07 at Fermilab. This result was used for MiniBooNE first  $\nu_e$  appearance search analysis (Phys. Rev. Lett. **98**, 231801 (2007)). We also

tested the Lorentz violating model for neutrino oscillations, including LSND with MiniBooNE data, and the result was presented at CPT and Lorentz symmetry '07 at Indiana University.

- 2006** I worked on 2 topics: a global model for neutrino oscillations with Lorentz violation and a muon neutrino charged-current quasi-elastic scattering ( $\nu_\mu$ CCQE) analysis. For the former, we constructed a model which describes the world neutrino oscillation data, including the LSND result, with Lorentz violation. We succeeded in creating a model that uses only 3 free parameters (Phys. Rev. D **74**, 105009 (2006)). For the latter, I studied the  $\nu_\mu$ CCQE event kinematics, and estimated the cross section error for our neutrino oscillation analysis. I also performed the  $\nu_\mu$ CCQE analysis with full systematic errors.
- 2005** I worked on 2 topics: a Lorentz violation search with the LSND data and a “dirt” event analysis for MiniBooNE. For the former, I performed an unbinned likelihood fit to extract the model parameters for an LSND oscillation signal with sidereal time variation. We found the result is consistent with no Lorentz violation. However, a Lorentz violation model is not completely ruled out (Phys. Rev. D **72**, 076004 (2005)). For the latter, I analyzed the dirt events, the background that originates outside of the detector and is an important background for MiniBooNE. We found that the dirt background is well-predicted with the Monte Carlo simulation.
- 2004** I worked on 2 experiments: the Mini-Booster Neutrino Experiment (MiniBooNE) at Fermilab and the Fine-grained Intense Neutrino Scattering Scintillator Experiment (FINEsSE). For MiniBooNE, we tested mineral oil in a 200 MeV proton beam (at Indiana University) for a better understanding of the nature of scintillation light. For FINEsSE, we tested a pilot detector with improved scintillator and Wave Length Shifting (WLS) fiber using the 200 MeV proton beam (Nucl. Instrum. Meth. A **562**, 198 (2006)). I worked on many aspects of the beam test, including calibration of the pilot detector, building the electronics, data taking, and data analysis. I also studied the light propagation model in the liquid scintillator. In addition, I worked on an analysis of the LSND signal to see a Lorentz violating signal.
- 2003** I studied the relationship between the light emission from the WLS fiber end and its surface condition. Also, I worked on a beam distribution calculation for the Booster Neutrino Beamline. In 2003, we also did the first beam test of our FINEsSE pilot detector.
- 2002** We tested the mineral oil of MiniBooNE using a proton beam. Also, I studied background neutrons for the FINEsSE experiment, which will be produced by the dirt around the detector.
- 2001** In my undergraduate studies, I worked on neutrino phenomenology. In particular, I studied exotic neutrino oscillation models and supernova neutrino signals.