

# Curriculum Vitae

Teppei Katori

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## Affiliation

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## Current status

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

## Work experience

**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

- 2012** EDIT2012 (Excellence in Detector and Instrumentation Technologies symposium, Fermilab, Feb.21-22, 2012), teaching assistant on gas argon TPC
- 2004** P221 Physics Lab. (Mechanics)
- 2003** G530 Teaching in the U.S. Class Room
- 2002-2003** Tutor of Physics Forum
- 2002** P504 Practicum in Physics Laboratory Instruction

## Publications, Talks, and Posters

### Major contributed publications

1. J. S. Daz, T. Katori, J. Spitz and J. M. Conrad, “Search for neutrino-antineutrino oscillations with a reactor experiment,” [arXiv:1307.5789 [hep-ex]].
2. T. Brieser *et al.*, “Testing of Cryogenic Photomultiplier Tubes for the MicroBooNE Experiment,” JINST **8**, T07005 (2013) [arXiv:1304.0821 [physics.ins-det]].
3. 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]].
4. 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]].
5. L. Bugel *et al.*, “Demonstration of a Lightguide Detector for Liquid Argon TPCs,” Nucl. Instrum. Meth. A **640**, 69 (2011) [arXiv:1101.3013 [physics.ins-det]].
6. 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]].
7. 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]].
8. 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].
9. R. Tayloe *et al.*, “A large-volume detector capable of charged-particle tracking,” Nucl. Instrum. Meth. A **562**, 198 (2006).

10. 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

1. Teppei Katori, “Tests of Lorentz Violation with Neutrinos,” Kouenerugii Nyuusu (KEK News, Sep. 2012, Japanese-only).
2. 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 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, will be published in “CPT and Lorentz Symmetry”, Proceedings of the Sixth Meeting on CPT and Lorentz symmetry (V. A. Kostelecký ed.), XXX-XXX, World Scientific (2013). [arXiv:1307.5805 [hep-ph]].
2. 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, will be published in “CPT and Lorentz Symmetry”, Proceedings of the First Light Detection In Noble Elements (S. Seibert ed.), XXX-XXX, JINST (2013). [arXiv:1307.5256 [physics.ins-det]].
3. 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 XXXX, XXX-XXX, American Institute of Physics Publishing (2013). [arXiv:1304.6014 [nucl-th]].
4. 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 XXXX, XXX-XXX, American Institute of Physics Publishing (2013). [arXiv:1304.5325 [hep-ex]].
5. 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, will be published in “ICHEP2012”, Proceedings of 36th International Conference on High Energy Physics, XXX-XXX, IOP Publishing (2012). [arXiv:1211.7129 [hep-ph]].
6. 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, will be published in “PASCOS2012”, Proceedings of 18th International Symposium on Particle Strings and Cosmology, XXX-XXX, IOP Publishing (2012).
7. 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).
8. 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).

9. 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).
10. 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]].
11. 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]].
12. 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.
13. 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).
14. 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]].
15. 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]].
16. 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).
17. 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).

18. Tepepei 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]].
19. Tepepei 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.
20. 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).

### Internally reviewed papers

1. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “First Measurement of the Muon Anti-Neutrino Double-Differential Charged Current Quasi-Elastic Cross Section,” [arXiv:1301.7067 [hep-ex]].
2. B. Baptista *et al.*, “Benchmarking TPB-coated Light Guides for Liquid Argon TPC Light Detection Systems,” [arXiv:1210.3793 [physics.ins-det]].
3. G. Cheng *et al.* [MiniBooNE and SciBooNE Collaborations], “Dual baseline search for muon antineutrino disappearance at  $0.1\text{eV}^2 < \Delta m^2 < 100\text{eV}^2$ ,” Phys. Rev. D **86**, 052009 (2012) [arXiv:1208.0322 [hep-ex]].
4. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Measurement of the neutrino component of an anti-neutrino beam observed by a non-magnetized detector,” Phys. Rev. **D84** 072005 (2011) [arXiv:1102.1964 [hep-ex]].

### Other publications

1. B. J. P. Jones *et al.*, “A Measurement of the Absorption of Liquid Argon Scintillation Light by Dissolved Nitrogen at the Part-Per-Million Level,” [arXiv:1306.4605 [physics.ins-det]].
2. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Improved Search for  $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  Oscillations in the MiniBooNE Experiment,” [arXiv:1303.2588 [hep-ex]].
3. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “A Combined  $\nu_\mu \rightarrow \nu_e$  and  $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  Oscillation Analysis of the MiniBooNE Excesses,” [arXiv:1207.4809 [hep-ex]].
4. J. L. Hewett *et al.*, “Fundamental Physics at the Intensity Frontier,” [arXiv:1205.2671 [hep-ex]].
5. C. S. Chiu *et al.*, “Environmental Effects on TPB Wavelength-Shifting Coatings,” JINST **7**, P07007 (2012) [arXiv:1204.5762 [physics.ins-det]].
6. T. Akiri *et al.* [LBNE Collaboration], “The 2010 Interim Report of the Long-Baseline Neutrino Experiment Collaboration Physics Working Groups,” [arXiv:1110.6249 [hep-ex]].
7. K. B. M. Mahn *et al.* [SciBooNE and MiniBooNE Collaboration], “Dual baseline search for muon neutrino disappearance at  $0.5\text{eV}^2 < \Delta m^2 < 40\text{eV}^2$ ,” Phys. Rev. D **85**, 032007 (2012) [arXiv:1106.5685 [hep-ex]].

8. G. Cheng *et al.* [SciBooNE Collaboration], “Measurement of  $K^+$  production cross section by 8 GeV protons using high energy neutrino interactions in the SciBooNE detector,” *Phys. Rev. D* **84**, 012009 (2011) [arXiv:1105.2871 [hep-ex]].
9. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Measurement of Neutrino-Induced Charged-Current Charged Pion Production Cross Sections on Mineral Oil at  $E_\nu \sim 1$  GeV,” *Phys. Rev.* **D83** 052007 (2011) [arXiv:1011.3572 [hep-ex]].
10. Y. Nakajima *et al.* [SciBooNE Collaboration], “Measurement of inclusive charged current interactions on carbon in a few-GeV neutrino beam,” *Phys. Rev.* **D83**, 012005 (2011) [arXiv:1011.2131 [hep-ex]].
11. A. A. Aguilar-Arevalo *et al.* [The MiniBooNE Collaboration], “Measurement of  $\nu_\mu$ -induced charged-current neutral pion production cross sections on mineral oil at  $E_\nu \in 0.5 - 2.0$  GeV,” *Phys. Rev.* **D83** 052009 (2011) [arXiv:1010.3264 [hep-ex]].
12. J. Alonso *et al.* [DAEdALUS Collaboration], “A Study of Detector Configurations for the DUSEL CP Violation Searches Combining LBNE and DAEdALUS,” [arXiv:1008.4967 [hep-ex]].
13. A. A. Aguilar-Arevalo *et al.* [The MiniBooNE Collaboration], “Measurement of the Neutrino Neutral-Current Elastic Differential Cross Section,” *Phys. Rev.* **D82** 092005 (2010) [arXiv:1007.4730 [hep-ex]].
14. A. A. Aguilar-Arevalo *et al.* [The MiniBooNE Collaboration], “Observed Event Excess in the Mini-BooNE Search for  $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$  Oscillations,” *Phys. Rev. Lett.* **105**, 181801 (2010) [arXiv:1007.1150 [hep-ex]].
15. J. Alonso *et al.*, “Expression of Interest for a Novel Search for CP Violation in the Neutrino Sector: DAEdALUS,” [arXiv:1006.0260 [physics.ins-det]].
16. Y. Kurimoto *et al.* [SciBooNE Collaboration], “Measurement of neutral current coherent neutral pion production on carbon in a few-GeV neutrino beam,” *Phys. Rev. D.* **81**, 111102 (2010) [arXiv:1005.0059 [hep-ex]].
17. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Measurement of  $\nu_\mu$  and  $\bar{\nu}_\mu$  induced neutral current single  $\pi^0$  production cross sections on mineral oil at  $E_\nu \sim O(1\text{GeV})$ ,” *Phys. Rev. D.* **81**, 013005 (2010) [arXiv:0911.2063 [hep-ex]].
18. Y. Kurimoto *et al.* [SciBooNE Collaboration], “Measurement of Inclusive Neutral Current Neutral Pion Production on Carbon in a Few-GeV Neutrino Beam,” *Phys. Rev. D.* **81**, 033004 (2009) [arXiv:0910.5768 [hep-ex]].
19. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “A Search for Core-Collapse Supernovae using the MiniBooNE Neutrino Detector,” *Phys. Rev. D* **81**, 032001 (2010) [arXiv:0910.3182 [astro-ph.HE]].
20. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Measurement of the  $\nu_\mu$  charged current  $\pi^+$  to quasi-elastic cross section ratio on mineral oil in a 0.8 GeV neutrino beam,” *Phys. Rev. Lett.* **103**, 081801 (2009) [arXiv:0904.3159 [hep-ex]].
21. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “A Search for Electron Antineutrino Appearance at the  $\Delta m^2 \sim 1$  eV<sup>2</sup> Scale,” *Phys. Rev. Lett.* **103**, 111801 (2009). [arXiv:0904.1958 [hep-ex]].
22. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “A search for muon neutrino and antineutrino disappearance in MiniBooNE,” *Phys. Rev. Lett.* **103**, 061802 (2009) [arXiv:0903.2465 [hep-ex]].
23. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Unexplained Excess of Electron-Like Events From a 1-GeV Neutrino Beam,” *Phys. Rev. Lett.* **102**, 101802 (2009) [arXiv:0812.2243 [hep-ex]].
24. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “First Measurement of  $\nu_\mu$  and  $\nu_e$  Events in an Off-Axis Horn-Focused Neutrino Beam,” *Phys. Rev. Lett.* **102**, 211801 (2009) [arXiv:0809.2447 [hep-ex]].

25. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “The MiniBooNE Detector,” Nucl. Instrum. Meth. A **599**, 28 (2009) [arXiv:0806.4201 [hep-ex]].
26. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “The Neutrino Flux prediction at MiniBooNE,” Phys. Rev. D. **79**, 072002 (2009) [arXiv:0806.1449 [hep-ex]].
27. K. Hiraide *et al.* [SciBooNE Collaboration], “Search for Charged Current Coherent Pion Production on Carbon in a Few-GeV,” Phys. Rev. D. **78**, 112004 (2008) [arXiv:0811.0369 [hep-ex]].
28. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Compatibility of high- $\Delta m^2$   $\nu_e$  and  $\bar{\nu}_e$  neutrino oscillation searches,” Phys. Rev. D **78**, 012007 (2008) [arXiv:0805.1764 [hep-ex]].
29. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “First Observation of Coherent  $\pi^0$  Production in Neutrino Nucleus Interactions with  $E_\nu < 2$  GeV,” Phys. Lett. B **664**, 41 (2008) [arXiv:0803.3423 [hep-ex]].
30. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “Constraining Muon Internal Bremsstrahlung as a Contribution to the MiniBooNE Low Energy Excess,” [arXiv:0706.3897 [hep-ex]].
31. A. A. Aguilar-Arevalo *et al.* [MiniBooNE Collaboration], “A Search for Electron Neutrino Appearance at the  $\Delta m^2 \sim 1eV^2$  Scale,” Phys. Rev. Lett. **98**, 231801 (2007) [arXiv:0704.1500 [hep-ex]].
32. L. Bugel *et al.* [FINeSSE Collaboration], “A Proposal for A Near Detector Experiment on The Booster Neutrino Beamline: FINeSSE: Fermilab Intense Neutrino Scattering Scintillator Experiment,” arXiv:hep-ex/0402007.
33. 2004 APS Neutrino Study, Neutrino Astrophysics and Cosmology Working Group, “The Neutrino Matrix,” arXiv:physics/0411216.

## 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 talks

1. “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
2. “MicroBooNE photon collection system”, Light Detection In Noble Elements 2013 (LIDINE2013), Fermilab, Batavia, IL, USA, May 31, 2013
3. “Tests of Lorentz and CPT violation with neutrino”, APS 2013 April meeting, Denver, CO, April 15, 2013
4. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, TRIUMF colloquium, TRIUMF, Vancouver, Canada, February 12, 2013
5. “MiniBooNE and SciBooNE experiments, and their cross section analyses”, Neutrino-Nucleus Interactions 2012 (NuInt12), CBPF, Rio de Janeiro, Brazil, October 22, 2012
6. “Meson exchange current (MEC) model in neutrino interaction generator”, Neutrino-Nucleus Interactions 2012 (NuInt12), CBPF, Rio de Janeiro, Brazil, October 22, 2012
7. “Test for Lorentz and CPT violation with Neutrinos”, 36th International Conference on High Energy Physics (ICHEP2012), Melbourne, Australia, July 10, 2012
8. “Test for Lorentz and CPT violation with Neutrinos”, 18th International Symposium on Particle Strings and Cosmology (PASCOS2012), Merida, Mexico, June 5, 2012

9. “Tests of Lorentz Invariance with Neutrinos”, NPAC forums, UW-Madison, Madison, WI, February 29, 2012
10. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, Wine and Cheese seminar, Fermilab, Batavia, IL, November 11, 2011
11. “MiniBooNE, A Neutrino Oscillation Experiment at Fermilab”, Physics and Astronomy colloquium, Tufts University, Boston, MA, September 30, 2011
12. “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
13. “SciBooNE, A Neutrino Cross Section Measurement Experiment at Fermilab”, New Trends in High Energy Physics 2011, Alushta, Crimea, Ukraine, September 6, 2011
14. “MiniBooNE, A Neutrino Oscillation Experiment at Fermilab”, New Trends in High Energy Physics 2011, Alushta, Crimea, Ukraine, September 6, 2011
15. “US Liquid Argon Time Projection Chamber (LArTPC) experiments”, Neutrino-Nucleus Interactions 2011 (NuInt11), Dehradun, India, March 7, 2011
16. “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
17. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, Elba Electron-Nucleus Scattering Workshop XI, Elba, Italy, June 23, 2010
18. “Test for Lorentz violation in the neutrino oscillation experiments”, Polskie Towarzystwo Fizyczne Oddzial Wroclaw, Seminarium Instytutow Fizyki U Wr, Wroclaw, Poland, November 27, 2009
19. “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
20. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, Neutrino-Nucleus Interactions 2009 (NuInt09), Sitges, Spain, May 19, 2009
21. “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
22. “The first result of MiniBooNE oscillation experiment”, Physics of Massive Neutrinos 2007 (PMN07), Blaubeuren, Germany, July 03, 2007
23. “Charged-Current Interaction Measurements in MiniBooNE”, Neutrino-Nucleus Interactions 2007 (NuInt07), Fermilab, Batavia, IL, June 31, 2007
24. “FINESS,  $\Delta s$  measurement through the Neutrino-Nucleon Neutral Current Scattering”, Pan Pacific spin 2005, Tokyo Institute of Technology, Tokyo, Japan, July 5, 2005

## Seminars

1. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, HEP seminar, Imperial College London, London, UK, March 14, 2013
2. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, ACP seminar, Kavli IPMU, Kashiwa, Japan, February 6, 2013
3. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, Penn State HEP/Astrophysics seminar, Pennsylvania State University, State College, PA, January 23, 2013

4. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, SMU HEP seminar, Southern Methodist University, Dallas, TX, September 24, 2012
5. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, HEP seminar, University of Toronto, Toronto, ON, Canada, April 10, 2012
6. “Test of Lorentz and CPT violation with neutrinos”, HEP seminar, University of Toronto, Toronto, ON, Canada, April 5, 2012
7. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, Harvard HEP seminar, Harvard University, Boston, MA, October 5, 2011
8. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, MIT lunch seminar, Massachusetts Institute of Technology, Boston, MA, September 29, 2011
9. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, U-Chicago HEP lunch seminar, University of Chicago, Chicago, IL, April 18, 2011
10. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, NU HEP seminar, Northwestern university, Evanston, IL, April 11, 2011
11. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, Glasgow HEP seminar, University of Glasgow, Glasgow, Scotland, March 21, 2011
12. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, BHU HEP seminar, Banaras Hindu University, Varanasi, India, March 17, 2011
13. “Analysis Techniques of Neutrino Cross Section Measurements in MiniBooNE”, PPD/Neutrino physics discussion seminar, Fermilab, Batavia, IL, November 5, 2010
14. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, HEP/Nuclear physics joint seminar, University of Maryland, College Park, MD, October 5, 2010
15. “MiniBooNE, a neutrino oscillation experiment at Fermilab”, SMU HEP seminar, Southern Methodist University, Dallas, TX, September 27, 2010
16. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, NU HEP seminar, Northwestern university, Evanston, IL, September 20, 2010
17. “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
18. “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
19. “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
20. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, Wroclaw neutrino group seminar, Wroclaw, Poland, November 30, 2009
21. “MiniBooNE, a neutrino experiment at Fermilab”, Wroclaw undergrad seminar, Wroclaw, Poland, November 26, 2009
22. “MiniBooNE, a neutrino experiment at Fermilab”, HEP group seminar, Waseda university, Tokyo, Japan, June 10, 2009
23. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, ICRR seminar, Kamioka, Japan, June 8, 2009

24. “Test of Lorentz violation in the neutrino oscillation experiments”, KEK seminar, Tsukuba, Japan, June 5, 2009
25. “First Measurement of Muon Neutrino Charged Current Quasielastic (CCQE) Double Differential Cross Section”, J-PARC T2K group seminar, Tokai, Japan, June 3, 2009
26. “MiniBooNE, a neutrino experiment at Fermilab”, Spin and hadron group seminar, Tokyo Institute of Technology, Tokyo, Japan, June 1, 2009
27. “MiniBooNE, a neutrino experiment at Fermilab”, LPNHE seminar, Denis Diderot (Paris-VII) University, Paris, France, May 25, 2009
28. “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
29. “Measurement of muon neutrino charged current quasielastic (CCQE) scattering on carbon in MiniBooNE”, University of Wisconsin, Madison, WI, May 23, 2008
30. “Test for Lorentz and CPT violation using the neutrino oscillation”, Columbia University Particle seminar, New York, NY, September 19, 2007
31. “The first result of MiniBooNE oscillation experiment”, McGill University HEP seminar, Montreal, QC, Canada, May 09, 2007
32. “ $\Delta_s$ , Lorentz Violation and Neutrinos”, Kyoto University spin physics group seminar, Kyoto, Japan, July 12, 2005
33. “ $\Delta_s$ , Lorentz Violation and Neutrinos”, PhD candidacy seminar, Bloomington, IN, April 26, 2005

## Other talks

1. “MicroBooNE neutrino cross section measurements”, Neutrino Nucleus Generators, PITTPACC, Pittsburgh, PA, June 9, 2013
2. “MicroBooNE photon detection system”, LArTPC R&D workshop, Fermilab, Batavia, March 20, 2013
3. “Test for Lorentz and CPT violation with neutrino oscillation experiments”, Short talk for Queen Mary University of London, London, UK, March 12, 2013
4. “Research plan”, Short talk for Excellence Cluster (phone), Munich, Germany, February 6, 2013
5. “Test of Lorentz and CPT violation with MiniBooNE excesses”, LVNU’12, IUCSS, Bloomington, IN, March 11, 2012
6. “Neutrino signals with SME”, SME workshop, IUCSS, Bloomington, IN, August 13, 2011
7. “Test of Lorentz and CPT Violation”, GSA lecture series, Fermilab, Batavia, IL, June 9, 2011
8. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, Short-Baseline Neutrino Workshop (SBNW11), Fermilab, Batavia, IL, May 13, 2011
9. “Test for Lorentz and CPT violation with the MiniBooNE excesses”, Phenomenology Symposium (PHENO) 2011, Madison, WI, May 9, 2011
10. “Test of Lorentz violation in the neutrino oscillation experiments”, ICRR lecture series, Kashiwa, Japan, June 26, 2009
11. “MiniBooNE CCQE analysis”, Saclay T2K group, Saclay, France, May 27, 2009
12. “Global Lorentz Violation Model for Neutrino Oscillation with MiniBooNE”, Phenomenology Symposium (PHENO) 2008, Madison, WI, April 28, 2008

13. “SciBooNE experiment, the neutrino cross section measurement”, Division of Nuclear Physics (DNP) 2007 Meeting, Newport News, VA, October 13, 2007
14. “Charged-Current Interaction Measurements in MiniBooNE”, Division of Nuclear Physics (DNP) 2007 Meeting, Newport News, VA, October 13, 2007
15. “The neutrino interaction measurements in MiniBooNE experiment”, Physics of Massive Neutrinos (PMN) 2007, Blaubeuren, Germany, July 03, 2007
16. “ $\Delta s$  measurement through the neutrino neutral current elastic scattering”, International School of Physics “Enrico Fermi” course 167, Varenna, Italy, June 29, 2007
17. “Charged-current cross section measurements in MiniBooNE”, Division of Nuclear Physics (DNP) 2006 Meeting, Nashville, TN, October 26, 2006
18. “Global 3 parameter model for neutrino oscillations with Lorentz Violation”, Division of Nuclear Physics (DNP) 2006 Meeting, Nashville, TN, October 26, 2006
19. “MiniBooNE, a neutrino oscillation search at Fermilab”, National Nuclear Physics Summer School (NNPSS) 2006, Bloomington, IN, July 28, 2006
20. “FINeSSE,  $\Delta s$  measurement through neutrino scattering”, Division of Nuclear Physics (DNP) 2005 Meeting, Maui, HI, September 21, 2005
21. “Search for Lorentz Violation in LSND”, Division of Nuclear Physics (DNP) 2005 Meeting, Maui, HI, September 22, 2005
22. “FINeSSE, prototype beam test”, Division of Nuclear Physics (DNP) 2004 Meeting, Chicago, IL, October 29, 2004

## Outreach

1. “Masterclass video conference, meet the featured scientist”, Masterclass video conference, Fermilab, Batavia, IL, March 22, 2013
2. “Tape: A Celebration”, an art show at Chicago Art Department, 1932 S. Halsted st. #100, Chicago, IL, August 12, 2011
3. “Neutrino, Ghost Particle of the Atom”, State of the Arts Chicago, Truman College, Chicago, IL, May 2, 2011
4. “Hard Science”, an art show at Chicago Art Department, 1837 S. Halsted st., Chicago, IL, August 27, 2010
5. “Video meeting with Japanese students from Kyoto university, how to apply US graduate school?”, Fermilab, Batavia, IL, August 2, 2010
6. “Meeting with Super-Science High school (SSH) students from Japan”, QuarkNet Fermilab program, Fermilab, Batavia, IL, July 12, 2010
7. “Video conference to discuss Masterclass LEP/DELPHI data and LHC events”, QuarkNet Fermilab Masterclass, Fermilab, Batavia, IL, February 23, 2010
8. “Meeting with Super-Science High school (SSH) students from Japan”, QuarkNet Fermilab program, Fermilab, Batavia, IL, October 10, 2009
9. “An introduction of Japan for 3rd grade students”, Cicero public schools board of education district 99, Cicero, IL, May 12, 2009
10. “An introduction of Japan for 3rd grade students”, Cicero public schools board of education district 99, Cicero, IL, April 27, 2009

## Posters

1. “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
2. “Charged-Current Quasi-Elastic (CCQE) Interaction Measurements in MiniBooNE”, NSF site visit at Indiana University Cyclotron Facility, IUCF, Bloomington, IN, December 5, 2007
3. “Test for Lorentz violation in the MiniBooNE Experiment”, Fourth Meeting on CPT and Lorentz Symmetry Neutrino 2007, Bloomington, IN, August 9, 2007
4. “Global three parameter model for Neutrino Oscillations using Lorentz Violation”, Neutrino 2006, Lensec Theater, Santa Fe, NM, June 15, 2006
5. “A look inside the particle identification of MiniBooNE”, DOE site visit at Fermi National Accelerator Laboratory, Fermilab, Batavia, IL, August, 2006
6. “Test of Lorentz Violation with LSND”, Fermilab’s Graduate Student Association (GSA) New Perspectives 2006, Fermilab, Batavia, IL, May 31, 2006
7. “FINeSSE, Fine-grained Intense Neutrino Scintillator Scattering Experiment”, NSF site visit at Indiana University Cyclotron Facility, IUCF, Bloomington, IN, November 17, 2004
8. “FINeSSE, prototype detector beam test”, Fermilab’s Graduate Student Association (GSA) New Perspectives 2004, Fermilab, Batavia, IL, June 4, 2004
9. “FINeSSE, a neutrino scattering experiment”, Neutrino 2004, College de France, Paris, France, June 13-19, 2004 (absence from the poster session)

## Membership

1. American Physical Society, Division of Astrophysics (DAP), Division of Nuclear Physics (DNP), and Division of Particles and Fields (DPF)

## Service work

**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

**2013** Accelerator-based neutrino physics session convener, IPA 2013, UW-Madison, Madison, WI, May 13-15, 2013

**2013** Photon detection session convener, LArTPC R&D Workshop, Fermilab, Batavia, IL, Mar. 20-21, 2013

**2013** Referee of Nuclear Instruments and Methods in Physics Research Section A (NIMA)

**2012** Referee of Nuclear Instruments and Methods in Physics Research Section A (NIMA)

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

**2007** SciBooNE experiment shift coordinator

**2006-2007** MiniBooNE experiment shift coordinator

## Research

- 2013** I am an active collaborator on the the MiniBooNE, MicroBooNE, SciBooNE, and LBNE. For MiniBooNE, I remained as a on-site member. I was a reviewer of the muon antineutrino CCQE double cross section measurement analysis. The paper was published in this year (PRDXX(2013)XXXXXXX). For MicroBooNE, I am a convener for cross section working group and active detector working group. I am working on the preparation of installation of PMT system. The detail of PMT test I perform in the last years was presented at LArTPC R&D workshop at Fermilab, and it was later published (JINSTXXX). The detail of 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 iss later published (Phys. Rev. D **86**, 112009 (2012)). I accepted a position at Queen Mary, University of London. From this year, I join 2 new experiments, Tokai to KAmioka (T2K) experiment in Japan, and Precision IceCube Next Generation Upgrade (PINGU), in Antarctica.
- 2012** I was an active collaborator on the the MiniBooNE, MicroBooNE, SciBooNE, and LBNE. For MiniBooNE, I remained as a 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 active detector working group for PMT system. I worked on all aspects of 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 Lorentz Violation analysis on 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 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. These 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 on Lorentz violation was completed, and paper was published (Phys. Lett. B **718**, 1303 (2013)). This was presented at number of places, including Fermilab wine and cheese seminar (Nov. 11). For MicroBooNE, I continued to work on 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 over all talks at New Trends of High Energy Physics 2011, Crimea, Ukraine. For LBNE, I worked on R&D detector of 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 large detector array based on bis-MSB, not TPB. We also tested bis-MSB coated green houses to see the enhancement of 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 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 quasielastic (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 spectrometer. We also measured attenuation and transmission. Finally, we measured the response from vacuum ultra violet (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 life time in the liquid Argon. I also designed a base schematics for a test PMT at MIT (R7725mod), and the measurement of TPB coated lightguide 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 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 the 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 tetraphenyl butadiene (TPB). I also worked on the read out 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 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 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 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 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.

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