Kent Leung

Curriculum Vitae

PERSONAL INFORMATION

Email:	kkleung@ncsu.edu
Address:	2401 Stinson Dr, Riddick 421, Campus Box 8202, Raleigh 27695, USA
Phone number:	+1 (919) 442-8283
Nationality/Citizenship:	New Zealand (US H1B visa)
Website:	https://physics.sciences.ncsu.edu/people/kkleung

EDUCATION

2007 – 2013 **Dr. Rer. Nat. (Doctor of Natural Science) in Physics**
Magna cum laude (passed with distinction)
Technical University of Munich (TUM), Garching, Germany

2005 – 2007 **Master of Science in Physics**
First Class Honors
University of Auckland (UoA), New Zealand

2002 – 2005 **Bachelor of Science in Physics**
University of Auckland (UoA), New Zealand

EMPLOYMENT

2017 – current **Research Assistant Professor**
Physics Department
North Carolina State University (NCSU), Raleigh, NC, USA
(affiliation Triangle Universities Nuclear Laboratory (TUNL), Durham, NC, USA)

2013 – 2017 **Post-Doctoral Research Scholar**
Physics Department
North Carolina State University (NCSU), Raleigh, NC, USA
(affiliation Triangle Universities Nuclear Laboratory (TUNL), Durham, NC, USA)

2007 – 2011 **PhD Research Fellowship**
Nuclear and Particle Physics Group
Institut Laue-Langevin (ILL), Grenoble, France

2004 – 2007 **Teaching Assistant & Undergraduate Laboratory Technician**
Physics Department
University of Auckland (UoA), New Zealand

PUBLICATIONS

More information at https://scholar.google.com/citations?user=_pf63jQAAAAJ

• *A next-generation inverse-geometry spallation-driven ultracold neutron source*
K.K.H. Leung, G. Muhrer, T. Hügle, T.M. Ito, E.M. Lutz, M. Makela, C.L. Morris, R.W. Pattie Jr., A. Saunders, A.R. Young
Journal of Applied Physics 126(22):224901 (2019), doi:10.1063/1.5109879 (Editor's Pick)
Scilight publicity article: doi:10.1063/10.0000359

• *The neutron electric dipole moment experiment at the Spallation Neutron Source*
K.K.H. Leung, M. Ahmed, R. Alarcon, A. Aleksandrova, S. Baeßler, L. Barrón-Palos, L. Bartoszek, D.H. Beck, J. Bessuille, M.A. Blatnik, M. Broering, L.J. Broussard, M. Busch, R. Carr, P.-H. Chu, V. Cianciolo, S.M. Clayton, M.D. Cooper, C. Crawford, S.A. Currie, C. Daurer, R. Dipert, K. Dow, D. Dutta, Y. Efremenko, C.B. Erickson, B.W. Filippone, N. Fomin, H. Gao, R. Golub, C.R. Gould, G.L. Greene, D.G. Haase, D. Hasell, A.I. Hawari, M.E. Hayden, A.T. Holley, R.J. Holt, P.R. Huffman, E. Ihloff, T.M. Ito, J. Kelsey, Y.J. Kim, J. Koivuniemi, E. Korobkina, W. Korsch, S.K. Lamoreaux, E. Leggett, A. Lipman, C.-Y. Liu, J. Long, S.W.T. MacDonald, M. Makela, A. Matlashov, J. Maxwell, M. McCrea, M. Mendenhall, H.O. Meyer, R. Milner, P. Mueller, N. Nouri, C.M. O'Shaughnessy, C. Osthelder, J.-C. Peng, S. Penttila, N.S. Phan, B. Plaster, J. Ramsey, T. Rao, R. P. Redwine, A. Reid, A. Saftah, G.M. Seidel, I.F. Silvera, S. Slutsky, E. Smith, W.M. Snow, W. Sondheim, S. Sosothikul, T.D.S. Stanislaus, X. Sun, C.M. Swank, Z. Tang, R. Tavakoli Dinani, E. Tsentalovich, C. Vidal, W. Wei, C.R. White, S.E. Williamson, L. Yang, W. Yao, A.R. Young

European Physical Journal Web of Conferences 219, 02005 (2019). doi:10.1051/epjconf/201921902005

- *A new cryogenic apparatus to search for the neutron electric dipole moment*

M. W. Ahmed, R. Alarcon, A. Aleksandrova, S. Baessler, L. Barron-Palos, L. M. Bartoszek, D. H. Beck, M. Behzadipour, J. Bessuille, M. Blatnik, M. Broering, L. J. Broussard, M. Busch, R. Carr, V. Cianciolo, S. M. Clayton, M. D. Cooper, C. Crawford, S. A. Currie, C. Daurer, R. Dipert, K. Dow, D. Dutta, Y. Efremenko, C. B. Erickson, B. W. Filippone (Corresponding author), N. Fomin, H. Gao, R. Golub, C. R. Gould, G. Greene, D. G. Haase, D. Hasell, A. I. Hawari, M.E. Hayden A. Holley, R. J. Holt, P. R. Huffman, E. Ihloff, S. K. Imam, T. M. Ito, M. Karcz, J. Kelsey, D. P. Kendellen, Y. J. Kim, E. Korobkina, W. Korsch, S. K. Lamoreaux, J. Leggett, K. K. H. Leung, A. Lipman, C. Y. Liu, J. Long, S. W. T. MacDonald, M. Makela, A. Matlashov, J. D. Maxwell, M. Mendenhall, H. O. Meyer, R. G. Milner, P. E. Mueller, N. Nouri, C. M. O'Shaughnessy, C. Osthelder, J. C. Peng, S. I. Penttila, N. S. Phan, B. Plaster, J. C. Ramsey, T. M. Rao, R. P. Redwine, A. Reid A. Saftah, G. M. Seidel, I. Silvera S. Slutsky, E. Smith, W. M. Snow, W. Sondheim, S. Sosothikul, T. D. S. Stanislaus, X. Sun, C. M. Swank, Z. Tang, R. Tavakoli Dinani E. Tsentalovich, C. Vidal, W. Wei, C. R. White, S. E. Williamson, L. Yang, W. Yao, A. Young
Journal of Instrumentation 14(11):11017 (2019) doi:10.1088/1748-0221/14/11/p11017

- *Solid deuterium surface degradation at ultracold neutron sources*

A. Anghel […] P. Huffman, T. M. Ito, K. Kirch, E. Korobkina, B. Lauss, K. Leung, […] G. Zsigmond
The European Physical Journal A, 54(9):148, 9 (2018) doi:10.1140/epja/i2018-12594-2 (EPJ-A highlights)

- *Spin flip loss in magnetic confinement of ultracold neutrons for neutron lifetime experiments*

A. Steyerl, K.K.H. Leung, C. Kaufman, G. Müller, and S.S. Malik
Physical Review C 95, 035502 (2017) doi:10.1103/PhysRevC.95.035502

- *Neutron lifetime measurements and effective spectral cleaning with an ultracold neutron trap using a vertical Halbach octupole permanent magnet array*

K.K.H. Leung, P. Geltenbort, S. Ivanov, F. Rosenau, and O. Zimmer.
Physical Review C 94, 045502 (2016). doi:10.1103/PhysRevC.94.045502

- *Position-sensitive detection of ultracold neutrons with an imaging camera and its implications to spectroscopy*

W. Wei, L.J. Broussard, M.A. Hoffbauer, M. Makela, C.L. Morris, Z. Tang […] K.K. Leung […] and Zhehui Wang.
Nucl. Instr. Meth. Phys. Res. A, 830, 36-43 (2016). doi:10.1016/j.nima.2016.05.058

- *Ultracold neutron production and up-scattering in superfluid helium between 1.1 K and 2.4 K*

K.K.H. Leung, S. Ivanov, F. M. Piegsa, M. Simson, and O. Zimmer.
Physical Review C, 93.025501 (2016). doi:10.1103/PhysRevC.93.025501

- *Experimental study of ultracold neutron production in pressurized superfluid helium*

P. Schmidt-Wellenburg, J. Bossy, E. Farhi, M. Fertl, K.K.H. Leung, A. Rahli, T. Soldner, and O. Zimmer.
Physical Review C, 92:024004 (2015). doi:10.1103/PhysRevC.92.024004

- *A comparison of two magnetic ultra-cold neutron trapping concepts using a Halbach-octupole array*

K. Leung, S. Ivanov, F. Martin, F. Rosenau, M. Simson, and O. Zimmer. **Next Generation Experiments to Measure the Neutron Lifetime:** *proceedings of the 2012 Workshop,* World Scientific (2014). doi:10.1142/9016

- *New source for ultra-cold neutrons at the Institut Laue-Langevin*

F.M. Piegsa, M. Fertl, S.N. Ivanov, M. Kreuz, K.K.H. Leung, P. Schmidt-Wellenburg, T. Soldner, and O. Zimmer.
Physical Review C, 90:015501 (2014). doi:10.1103/PhysRevC.90.015501

- *Proposed neutron lifetime measurement using a hybrid magnetic trap for ultra-cold neutrons*

K.K.H. Leung and O. Zimmer.
Nucl. Instr. Meth. Phys. Res. A, 611 (2-3), 181-185 (2009). doi:10.1016/j.nima.2009.07.087

- *Half-life of the superallowed positron emitter Carbon-10*

P. H. Barker, K.K.H. Leung, and A. P. Byrne.
Physical Review C 79, 024311 (2009). doi:10.1103/PhysRevC.79.024311

- *The Proton Spectrum in Neutron Beta Decay: Latest Results with the aSPECT Spectrometer*

G. Konrad, F. Ayala Guardia, S. Baessler, M. Borg, F. Gluck, W. Heil, I. Konorov, K.K.H. Leung, R. Munoz Horta, M. Simson, Y. Sobolev, T. Soldner, H.-F. Wirth, and O. Zimmer.
Nuclear Physics A, 827 (1-4), PANIC08 - Proceedings of the 18th Particles and Nuclei International Conference, (2009). doi:10.1016/j.nuclphysa.2009.05.114

• *Measuring the proton spectrum in neutron decay – latest results with aSPECT*
M. Simson, F. Ayala Guardia, S. Baeßler, M. Borg, F. Gluck, W. Heil, I. Konorov, G. Konrad, R. Munoz Horta, K.K.H. Leung, Yu. Sobolev, T. Soldner, and H.-F. Wirth.
Nucl. Instr. Meth. Phys. Res. A, 611 (2-3), 203-206 (2009). doi:10.1016/j.nima.2009.07.068

• *Notable acknowledgements:*
- D. Dubbers and M.G. Schmidt. The neutron and its role in cosmology and particle physics. Reviews of Modern Physics, 83:1111 (2011). doi:10.1103/RevModPhys.83.1111
- T.E. Chupp, P. Fierlinger, M.J. Ramsey-Musolf, and J.T. Singh. Electric dipole moments of atoms, molecules, nuclei, and particles. Reviews of Modern Physics, 91:015001 (2019). doi:10.1103/RevModPhys.91.015001

THESES

• Doctoral thesis (2013), Technical University of Munich & Institut Laue Langevin, Dr. Oliver Zimmer
"Development of a new superfluid helium ultra-cold neutron source and a new magnetic trap for neutron lifetime measurements"
http://mediatum.ub.tum.de/node?id=1119646

• Masters thesis (2009), University of Auckland, Dr. Paul Barker
"A New Method for Measuring the Half-Life of ^{10}C"
http://arxiv.org/abs/0911.5325v1

INVITED TALKS

Southeastern Section APS (SESAPS) meeting , Wilmington, NC (Nov 2019). *"Search for time-reversal violation with the neutron electric dipole moment (nEDM) experiment at the Spallation Neutron Source"*

Georgia Institute of Technology (GAtech) AMO seminar, Atlanta, GA (Oct 2019). *"Ultracold neutrons and the search for time-reversal violation from a permanent neutron electric dipole moment"*

Fundamental Neutron Physics Summer School lecture, Raleigh, NC (Jul 2018). *"Experimental overview of neutron electric dipole moment experiments"*

Nuclear physics seminar, University Tennessee Knoxville, Knoxville, TN (Apr 2018). *"Ultracold neutrons in electric dipole moment searches and magnetically trapped lifetime measurements"*

COHERENT collaboration meeting science talk, Duke University, NC (Jan 2018). "The *search for time-reversal violation with the neutron electric dipole moment at the Spallation Neutron Source*"

Southeastern Section APS (SESAPS) meeting, Georgia College, GA (Nov 2017). *"Search for time-reversal violation with the neutron electric dipole moment at the Spallation Neutron Source, ORNL"*

APS Division Nuclear Physics meeting, Pittsburgh PA (Oct 2017). *"Instrumentation for Physics Beyond the Standard Model overview"*

Physics Department Colloquium, North Carolina State University, Raleigh, NC (Apr 2017). *"Testing Fundamental Symmetries and Interactions with Ultracold Neutrons"*

Junior Professor position search seminar, Johannes Gutenberg University of Mainz, Germany (Jun 2016). *"Studies of Low-Energy Fundamental Interactions with Ultracold Neutrons"*. Position offered but declined.

12th Conference on the Intersections of Particle and Nuclear Physics (CIPANP 2015). Vail, CO (May 2015). *"The Neutron EDM Experiment at the Spallation Neutron Source (SNS nEDM)"*

Department Seminar, University of Kentucky, Lexington, KY (May 2015). *"Superfluid Helium Ultracold Neutron Sources and Magnetic Bottles for Neutron Lifetime Measurements at the Institut Laue-Langevin"*

General Seminar, **Institut Laue-Langevin,** Grenoble, France (Sep 2013). *"The PULSTAR systematics test apparatus of the SNS nEDM experiment"*

Department Seminar, University of Auckland, Auckland, New Zealand. (Dec 2012). *"Production of ultracold neutrons and measurements of the neutron lifetime with magnetically trapped neutrons"*

Seminar, NIST Center for Neutron Research, Gaithersburg, MD (Nov 2012). *"HOPE magnet trap for neutron lifetime and SUN2 superfluid helium source at ILL"*

Next Generation Experiments to Measure the Neutron Lifetime Workshop, Santa Fe, NM (Nov 2012). *"Progress towards neutron lifetime measurements with the HOPE magnetic UCN trap"*

Seminar, North Carolina State University, Raleigh, NC (Sep 2011). "*SUN2: a new, versatile, helium-based UCN source. First UCN production results & Progress towards neutron lifetime measurements with the HOPE magnetic UCN trap*"

Quantum Fluids and Solids: Neutrons and X-rays Studies workshop, Institut Laue-Langevin, Grenoble, France. (Aug 2010). "*New source of Ultracold Neutrons (UCNs) from a superfluid ^{4}He converter*"

E18 Department Seminar, Technical University of Munich, Garching, Germany (Mar 2010). "*Progress and future of neutron lifetime measurements with the HOPE magnetic UCN trap*"

OTHER CONFERENCES, WORKSHOPS AND TALKS

85th Annual Meeting of the APS Southeastern Section (SESAPS), Knoxville, TN (Oct 2018). Talk: "*Let there be light… and flux quanta: anticipating the first signals from nEDM@SNS*"

International Workshop on Particle Physics at Neutron Sources. Grenoble, France (May 2018). Selected to give talk on behalf of collaboration. Talk: "The search for a neutron EDM at the Spallation Neutron Source, ORNL"

Fall Meeting of the APS Division of Nuclear Physics. Vancouver, BC, Canada (Oct 2016). Talk: "*Measurement cells of the Spallation Neutron Source neutron Electric Dipole Moment experiment*." **Chaired session**: "*Mini-symposium on Instrumentation for Physics Beyond the Standard Model IB*"

International SPIN Symposium 2016. University of Illinois and Indiana University, Urbana-Champaign, IL (Sep 2016). Talk: "*PULSTAR systematics studies apparatus of the SNS nEDM experiment*"

International Workshop: Probing Fundamental Symmetries and Interactions with UCN. Johannes Gutenberg University of Mainz - Waldthausen Castle, Germany (Apr 2016). Talk: "*Measurement cells of the SNS nEDM experiment*" **Chaired session:** "*Decay correlations III and UCN-sources*"

Light Detection in Noble Elements 2015 (LIDINE). The University at Albany, State University of New York, Albany, NY (August 2015). Talk. "*Cryogenic, magnetic, RF, and ultra-cold neutron friendly measurement cells of the SNS nEDM experiment used for the detection of scintillations in superfluid helium*"

Fall Meeting of the APS Division of Nuclear Physics. Newport News, VA. (Oct 2013). Talk: "*The PULSTAR systematics studies apparatus of the SNS nEDM experiment*"

Physics of Fundamental Symmetries and Interactions at Low Energies and the Precision Frontier. Paul Scherrer Institut, Switzerland (Sep 2013). Poster: "*Development of a systematic studies apparatus at NC State for the nEDM collaboration*"

8th International Workshop on Ultra-Cold & Cold Neutrons Physics & Sources. Moscow - St. Petersburg, Russia (Jun 2011). Two talks: "*Progress towards neutron lifetime measurements with the HOPE magnetic UCN trap*" & "*SUN2: a new, versatile, helium-based UCN source: First UCN production results*"

2010 International Symposium on Quantum Fluids and Solids (QFS2010) & associated Cryoconference. World Trade Centre, Grenoble, France. (Aug 2010). Poster: "*SUN2: High-Intensity Source of Ultracold Neutrons from a Superfluid ^{4}He Converter*"

International Conference on Ultracold & Cold Neutrons Physics & Sources. St. Petersburg, Russia. (Jun 2009). Talk: "*Neutron Lifetime measurements with the new Halbach Octupole Permanent (H.O.PE) magnetic trap*"

1st EIROforum School of Instrumentation. CERN, Switzerland (May 2009). Poster: "*A Permanent Octupole Magnetic UCN Trap for Neutron Lifetime measurements*"

International Workshop on Particle Physics with Slow Neutrons. Institut Laue-Langevin, Grenoble, France (May 2008). Poster: "*A permanent Octupole Magnetic UCN trap for Neutron Lifetime Measurements*"

TEACHING EXPERIENCE

Lectures on "momentum", PY211 college non-calculus physics (NCSU 2018)

Lectures on "ideal gas law and kinetic theory", PY208 physics for engineers and scientists (NCSU 2017)

Lectures on Weak Interactions (2x), PY507 late-undergrad/electric grad Elementary Particle Physics (NCSU 2016)

Mentored student in PY499 "Independent Study in Physics" credited course (NCSU 2016)

Mentored student to obtain a research grant from the Office of Undergraduate Research (NCSU 2015)

Lectured Neutron Physics module (3 lectures) of PY506 Nuclear and Subatomic Physics (NCSU 2015)

Completed the Certificate in Teaching Techniques for Postdoctoral Scholars (NCSU 2015) requiring 12-hours of courses on: Introduction to Teaching, Learning Styles, Effective Questioning, Evaluation and Grading, Collaborative Learning and Groupwork, and Establishing Authority and Credibility in the Class Room.

Traveled and mentored 1st year PhD student (just the student & I) to participate in a 1-week long data taking beam time at Los Alamos National Laboratory. (NCSU 2015)

Lectured Physics 201 class—Introduction to Mechanics for Physics Majors (NCSU 2014)

Physics 201 class was evaluated by two senior faculty members: Paul Huffman and David Haase (NCSU 2014)

Completed workshops on: "Making the Most of Mentoring in Doctoral Education and Postdoctoral Life" and two-day "Advisor Academy workshop" (NCSU 2014-2015)

Blockpraktika teaching, 2x streams over 3 weeks, on the Franck-Hertz experiment (TUM 2010)

Installed and created instructions for new Earth's field NMR experiment for the Advanced Teaching Lab (UoA 2007)

Stage II & III (2nd & 3rd year) demonstrator, Advanced Nuclear & Quantum Teaching Laboratory (UoA 2005-2007)

Tutorials for the Physics for Life Sciences course (UoA 2007)

Private tutorials (for 4x groups of 4-5 students) for Physics for Life Sciences course (UoA 2007)

Stage I (1st year) Electrical Engineering Laboratory demonstrator (UoA 2007)

Stage I (1st year) Physics Teaching Laboratory demonstrator (UoA 2005-2007)

Tutor for the Stage I Physics Drop-in Help Room (UoA 2004-2005)

PROFESSIONAL SOCIETY PARTICIPATION

Member of The American Physical Society (2009 – current)

Referee for *Physical Review C: Nuclear Physics* (2016 – current)

Referee for *Reviews of Scientific Instruments* (2016 – current)

OUTREACH & SERVICE

Public talk *"To see a world in a grain of sand: what neutrons can tell us about the Universe"*, NCSU Annual PhysicsPhest (Nov 2019)

Physics and Math poster judge for North Carolina School of Science and Math high school (Feb 2019)

Annual Meeting of the APS Southeastern Section (SESAPS): student poster and talks judge (Oct 2018 & Nov 2019)

Radioactivity and cloud chamber activity for LEAP! (physics outreach for high school girls) at NCSU (2017 & 2018)

North Carolina School of Science & Mathematics Summer Accelerator program: created, organized, and ran outreach activities, involving NCSU's Society of Physics Students, to department lab tours and cloud chamber activity (2017)

Physics judge for North Carolina Student Academy of Science (NCSAS) research competition (2017)

Lesson plan: development and demonstration for middle school and high school teachers for The Scientific Research and Education Network, SciREN (2016) (www.thesciren.org/lesson/watching-elements-change-through-nuclear-decay)

Lead judge at the NC School of Science and Mathematics (ISEF-affiliated) science & engineering fair (2015 & 2016)

PBS Newshour: participated in the "STEM superstars" internet out-reach articles (2014) (www.pbs.org/newshour/extra/2014/04/the-stories-behind-22-stem-superstars)

Judge at the NC Central Regional Science & Engineering Fair and Academy of Science (2014)

Skeptics in the Pub talk: on The Big Bang model for the Auckland chapter of the society (2011)

National newspaper article: collaboration with journalist about my research (2009) (www.nzherald.co.nz/science/news/article.cfm?c_id=82&objectid=10590046 and www.odt.co.nz/lifestyle/magazine/going-nuclear)

PhD student body representative: elected to represent around 30 students to directors and management at the Institut Laue-Langevin (2008)