JUSTIN H. WILSON

PERSONAL INFORMATION

Born in Texas, 14 January 1985

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RESEARCH INTERESTS

Cold atoms; strongly correlated electron systems; mathematical physics; entanglement in condensed matter systems; the Casimir effect as a probe of condensed matter phenomena; topological states of matter; many-body localization.

EDUCATION

2007-2015   The University of Maryland, College Park

Doctor of Philosophy

GPA: 4.0 · *Theoretical Condensed Matter Physics* · Department: Physics
Dissertation: *Optical and Casimir Effects in Topological Materials*
Description: In this dissertation, I explored the Casimir effect of Weyl semimetals as well as in other thin-film materials along with the magneto-optics of a thin film topological insulator, the break down of the coherent state path integral.
Advisor: Prof. Victor M. GALITSKI

2007-2011   The University of Maryland, College Park

Master of Science

GPA: 4.0 · *Theoretical Condensed Matter Physics* · Department: Physics
Description: This degree focussed on graduate level coursework in physics.

2003-2007   Texas A&M University, College Station

Bachelor of Science
Bachelor of Science

GPA: 4.0 · Major: Physics
GPA: 4.0 · Major: Mathematics
Thesis: *Vacuum energy in quantum graphs*
Advisors: Prof. Stephen FULLING and Prof. Gregory BERKOLAIKO
Honors: *Summa Cum Laude*, Foundation Honors, University Honors, Honors in Math, and University Undergraduate Research Fellow.
Description: Double degrees in both physics and mathematics.

PUBLICATIONS

Papers in Refereed Journals

1. A. A. Allocca, J. H. Wilson, and V. M. Galitski, Quantum interference phenomena in the Casimir effect, *Phys. Rev. A* **91**, 062512 (2015). arXiv:1501.06096

2. J. H. Wilson, A. A. Allocca, and V. M. Galitski, Repulsive Casimir force between Weyl semimetals, *Phys. Rev. B* **91**, 235115 (2015). arXiv:1501.07659

3. J. H. Wilson, D. K. Efimkin, and V. M. Galitski, Resonant Faraday and Kerr effects due to in-gap states on the surface of topological insulator, *Phys. Rev. B* **90**, 205432 (2014). arXiv:1408.5139

4. A. A. Allocca, J. H. Wilson, and V. Galitski, Non-analytic behavior of the Casimir force across a Lifshitz transition in a spin-orbit coupled material, *Phys. Rev. B* **90**, 075420 (2014). arXiv:1312.6754

5. J. H. Wilson, J. Mitchell, and V. Galitski, Probing the structure of entanglement with entanglement moments, *Solid State Comm.* **195**, 43-48 (2014). arXiv:1305.2005

6. J. H. Wilson, B. M. Fregoso, and V. M. Galitski, Entanglement dynamics in a non-Markovian environment: An exactly solvable model, *Phys. Rev. B* **85**, 174304 (2012). arXiv:1202.1614

7. J. H. Wilson and V. Galitski, Breakdown of the coherent states path integral: two simple examples, *Phys. Rev. Lett.* **106**, 110401 (2011). arXiv:1012.1328

8. G. Berkolaiko, J. Harrison, and J. H. Wilson, Mathematical aspects of vacuum energy in quantum graphs, *J. Phys. A: Math. Theor.* **42**, 025204 (2009). arXiv:0711.2707

9. S. A. Fulling, P. Kuchment, and J. H. Wilson, Index theorems for quantum graphs, *J. Phys. A: Math. Theor.* **40**, 14165–14180 (2007). arXiv:0708.3456

10. S. A. Fulling, L. Kaplan, and J. H. Wilson, Vacuum energy and repulsive Casimir forces in quantum star graphs, *Phys. Rev. A* **76**, 012118 (2007). arXiv:quant-ph/0703248

Contributed Papers

1. S. A. Fulling and J. H. Wilson, Vacuum energy and closed orbits in quantum graphs, *Proc. Symp. Pure Math.* **77**, 673–689 (2008) (volume associated with the program Analysis on Graphs and its applications, Newton Institute, 2007).

Theses

Optical and Casimir Effects in Topological Materials, Ph. D. Dissertation in condensed matter physics, University of Maryland at College Park, 2015. http://hdl.handle.net/1903/16633

Vacuum Energy in Quantum Graphs, University Undergraduate Research Fellows Thesis, Texas A&M University, 2007. http://handle.tamu.edu/1969.1/5682

TALKS

Invited Talks

1. "Entanglement and the Hilbert-Schmidt distance", Department Seminar: Department of Physics, Boston University, Boston (7 December 2012).

2. "Lie Algebraic approaches to quantum dynamics: The breakdown of the coherent state path integral and the Bose-Hubbard model." Conference: *Lie Theory and Its Applications in Physics*, Varna, Bulgaria (June 2011)

3. "Generalized Method of Images on Quantum Graphs", Departmental Seminar: Department of Mathematics, Texas A&M University, Texas (2 November 2007).

4. "The Method of Images on a Quantum Graph", Conference: *Quantum Graphs, their Spectra and Applications*, Newton Institute, Cambridge, U.K., (15 March 2007).

Contributed Talks

1. "Repulsive Casimir effect between Weyl semimetals", *APS March Meeting*, San Antonio, TX (March 2015).

2. "Optics of midgap impurity states on a surface of a topological insulator", *APS March Meeting*, Denver, CO (March 2014).

3. "Quantum geometry and entanglement in the Rabi model", *APS March Meeting*, Baltimore, MD (March 2013).

4. "A Lie-algebraic approach to decoherence in a quantum spin system", *APS March Meeting*, Boston, MA (28 February 2012).

5. "Breakdown of the coherent state path integral: two simple examples", *APS March Meeting*, Dallas, TX (March 2011).

6. "Path integral representation of a two qubit system", *APS March Meeting*, Portland, OR (March 2010)

7. "Vacuum Energy in Quantum Graphs", Conference: *Quantum Field Theory Under the Influence of External Conditions*, Universität Leipzig, Germany, (September 2007).

Contributed Posters

1. "Entanglement dynamics in a non-Markovian environment: An exactly solvable model", *Nonlinear Physics at the Nanoscale: A Cross-Fertilization on Stochastic Methods*, Rotorua, NZ (February 2015).

2. "Resonant Faraday and Kerr effects due to in-gap states on the surface of topological insulator", *GRC/GRS: Correlated electron systems*, Mount Holyoke College, South Hadley, MA (June 2014).

OTHER MEETINGS ATTENDED

Conferences

1. *International Conference on Atomic Physics (ICAP) 2014*, Washington, DC (August 2014).

2. *Analysis on Graphs and its Applications Follow-up*, Netwon Institute, Cambridge, U.K., (July 2010).

3. *Quantum Field Theory Under the Influence of External Conditions*, University of Oklahoma, Norman, OK (September 2009).

Summer Schools

1. *Princeton Summer School in Condensed Matter Physics: Quantum Information*, Princeton University, Princeton, NJ (July 2014).

2. *Boulder School 2013: Disorder and dynamics in quantum systems*, Boulder, CO (July-August, 2013)

3. *Princeton Summer School in Condensed Matter Physics: Critical Phenomena and Quantum Computation*, Princeton University, Princeton, NJ (July 2012).

4. *LMS instructional course: Analysis on Graphs and its Applications*, Gregynog Hall, Wales (January 2007).

OTHER INFORMATION

Service

2011-present · Referee for IOP journals J. Phys. A, J. Phys. B, and J. Phys.: Cond. Mat.

2006–2007 · Vice President, Texas A&M chapter of Pi Mu Epsilon.

Popular Talks

1. "Real Fake-Particles: From Crystals to Quantum Computation to the Nature of the Universe", *Skepticamp DC*, College Park, MD (September 2012).

2. "Quantum Physics and its Interpretations", *Skepticamp DC*, College Park, MD (October 2011).

Awards

2008 · Iskraut award for classical physics (Highest score on classical physics qualifier), **$1,000**.

2007 · Texas A&M University's nominated thesis (see above thesis) for the National Collegiate Honors Council's (NCHC) Portz Award.

2005–2007 · Astronaut Scholar, **$20,000**.

2006 · John B. Beckham Award; given to two graduating seniors in the College of Science at Texas A&M, **$1,000**.

2006 · James G. Potter Scholarship, **$500**.

2005, 2006 · Honors Incentive Award, **$2,000**.

2005 · First Place in Texas A&M Freshman-Sophomore Math Contest.

Honor Societies

2006 · Phi Beta Kappa.

2007 · Phi kappa Phi.

2007 · Sigma Xi.

2006 · Pi Mu Epsilon.

June 29, 2015