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: *Path integration, entanglement, and electromagnetic properties of magnetically tunable materials*
Description: In this dissertation, I explore the break down of the coherent state path integral, entanglement dynamics and characterization, along with the magneto-optics of a thin film topological insulator, and the Casimir effect of Weyl semimetals.
Advisor: Prof. Victor 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

GPA: 4.0 · Major: Physics

Bachelor of Science

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. Galitski, Non-analytic behavior of the Casimir force across a Lifshitz transition in a spin-orbit coupled material, *Accepted for publication in PRB*. arXiv:1312.6754
2. 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
3. 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
4. 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

5. 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
6. 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
7. 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).

Thesis

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. "Optics of midgap impurity states on a surface of a topological insulator", *APS March Meeting*, Denver, CO (March 2014).
2. "Quantum geometry and entanglement in the Rabi model", *APS March Meeting*, Baltimore, MD (March 2013).
3. "A Lie-algebraic approach to decoherence in a quantum spin system", *APS March Meeting*, Boston, MA (28 February 2012).
4. "Breakdown of the coherent state path integral: two simple examples", *APS March Meeting*, Dallas, TX (March 2011).
5. "Path integral representation of a two qubit system", *APS March Meeting*, Portland, OR (March 2010)
6. "Vacuum Energy in Quantum Graphs", Conference: *Quantum Field Theory Under the Influence of External Conditions*, Universität Leipzig, Germany, (September 2007).

Contributed Posters

1. "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.

August 19, 2014