

Nikolaus Hartman

EXPERIMENTAL PHYSICIST

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Summary

Experimental condensed matter physicist with extensive nano-fabrication, low-noise measurement, and data analysis experience looking to move in to the industry of building real quantum computers. My interests range along the entire quantum computing stack including single qubit design/testing, low temperature amplification, and high-level control software.

Experience

University of British Columbia

Vancouver, BC, Canada

POSTDOCTORAL FELLOW – QUANTUM TRANSPORT LAB

Oct. 2015 - PRESENT

- Designed and tested the first measurement of entropy at the single particle level. Currently working on follow up experiments to investigate single and multiple channel Kondo effect using this technique.
- Measured spin impurities in graphene through magnetotransport. Identified new Kondo-like physics in graphene below 50mK.
- Worked with Microsoft quantum computing and University of Copenhagen to design InAs-based Majorana fermion devices. Iterative design/testing process helped steer the collaboration toward stable 2DEG device geometries. Additional collaboration with UBC chemistry investigated alternate routes to clean Al etching.
- Collaborated on design and testing of custom dilution refrigerator electronics, with a focus on efficient electron cooling. Designed and fabricated a number of unique broadband filters, resulting in a cryogen free dilution refrigerator with 25mK electron temperatures.

Johns Hopkins University

Baltimore, MD, USA

DOCTORAL STUDENT

Aug. 2008 - Aug. 2015

- Investigated a variety of spin-dependent phenomena in low-noise, low-temperature transport measurements. Identified suppressed conductance in ferromagnetically contacted CNT quantum dots due to spin selection rules.
- Fabricated single wall carbon nanotube quantum dots using chemical vapor deposition along with various microscopy and lithographic techniques. Improved electron lithography resolution to 25nm by adopting cutting edge processing techniques. Built novel image processing tool to improve device design accuracy and throughput (gh-link).
- Measured devices in a variety of custom-wired cryostat systems from 4K down to 50mK. Nanotube devices were measured using hand-built amplifiers with from-scratch LabVIEW and Python control software.
- Characterized electrical conductivity in peptide fibers using atomic and electric force microscopy as part of nano-biotech collaboration with JHU chemistry and materials science.
- Managed maintenance and new user training for scanning electron microscope and clean room (including thermal evaporator, acid bench, and mask aligner systems) facilities.

Education

Johns Hopkins University

Baltimore, MD, USA

PH.D., EXPERIMENTAL CONDENSED MATTER PHYSICS

Aug. 2008 - Aug. 2015

- Thesis: *Fabrication and Transport Properties of Carbon Nanotube Quantum Dots with Ferromagnetic and Superconducting Leads*

University of Pittsburgh

Pittsburgh, PA, USA

B.S., PHYSICS

Aug 2003 - Apr 2007

- Minors in Music and Mathematics

Skills

Experimental

Electron Beam and UV Lithography, Low-Noise and Analog Electronics, Cryogenics (dilution refrigerator and He3 cryostats), High Vacuum, Chemical Vapor Deposition, Thin Film Deposition, Atomic and Electric Force Microscopy

Analysis

Scientific Python, UNIX, git, LaTeX, IGOR Pro, LabVIEW, MATLAB

Teaching

- Extensive experience as a teaching assistant including Electricity and Magnetism, Classical Mechanics, Modern Physics, Statistical Mechanics, and Quantum Mechanics.
- Two years as head teaching assistant, leading group of 5-10 TAs, in General Physics I+II.
- Awarded Rowland Prize for Innovation and Excellence in Teaching at JHU in 2011
- Supervised many undergraduate interns as a post-doc at UBC and graduate student at JHU. Projects ranged from a successful home-built ALD reactor to customized RPi-based measurement electronics.

Publications and Talks

Author

Kondo-like behavior in monolayer CVD graphene at low temperatures

Nikolaus Hartman, Hyungki Shin, Ebrahim Sajadi, Ali Khademi, Silvia Lüscher, Joshua Folk
(IN PREP).

Direct entropy measurement in a mesoscopic quantum system

Nikolaus Hartman, Christian Olsen, Silvia Lüscher, Mohammad Samani, Saeed Fallahi, Geoffrey C Gardner, Michael Manfra, Joshua Folk
Nature Physics (2018).

Measurement of critical currents of superconducting aluminum nanowires in external magnetic fields: Evidence for a Weber blockade

T. Morgan-Wall, B. Leith, N. Hartman, A. Rahman, N. Marković
Physical Review Letters 114, 077002 (2015).

Fabrication of sub-15nm aluminum wires by controlled etching

T. Morgan-Wall, H. J. Hughes, N. Hartman, T. M. McQueen, N. Marković
Applied Physics Letters 104, 173101 (2014).

Synthesis and alignment of discrete polydiacetylene-peptide nanostructures

S. R. Diegelmann, N. Hartman, N. Marković, J. D. Tovar
Journal of the American Chemical Society 134, 2028–2031 (2012).

Speaker

Quantum Computing: From Transistors to Quantum Supremacy

N. Hartman
Nerd Nite YVR—Vancouver, BC, Canada (June 2018).

Direct Entropy Measurement in a Mesoscopic Quantum System

N. Hartman, C. Olsen, S. Luescher, M. Samani, S. Fallahi, G. Gardner, M. Manfra, J. Folk
Condensed Matter Seminar—Stanford University, CA, USA (March 2018).

Suppressed Conductance From Spin-Selection Rules in F-CNT-F Quantum Dots

N. Hartman, T. Morgan-Wall, N. Marković
APS March Meeting—Baltimore, MD, USA (March 2016).

Charge and Spin Transport in Carbon Nanotube Quantum Dots

N. Hartman, N. Marković
Condensed Matter Seminar—University of California Santa Barbara, CA, USA (June 2015).