Merritt Losert

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Education

2018 - 2024 **University of Wisconsin-Madison**, PhD (Physics) (GPA: 3.82)
Advisors: Mark Friesen, Susan Coppersmith

2013 - 2017 **Dartmouth College**, BA, *Magna Cum Laude* (GPA: 3.81)
Majors: Physics, Computer Science. Minor: German Studies

2009 - 2013 Wellesley High School, *Valedictorian* (GPA: 5.0/5.0)

Research Interests

I am a theoretical and computational physicist studying quantum computing with semiconductor quantum dots. I focus on leveraging device properties and architecture design to create a scalable quantum computing platform.

PhD Dissertation

"Alloy Disorder, Valley Splitting, and Shuttling for Spin Qubits in Silicon/Silicon-Germanium Heterostructures." October 2024.

Preprints

[1] Collin C. D. Frink, Benjamin D. Woods, **Merritt P. Losert**, E. R. MacQuarrie, M. A. Eriksson, and Mark Friesen. *Reducing strain fluctuations in quantum dot devices by gate-layer stacking*. 2024. arXiv: 2312.09235.

[2] Róbert Németh, Vatsal K. Bandaru, Pedro Alves, **Merritt P. Losert**, Emma Brann, Owen M. Eskandari, Hudaiba Soomro, Avani Vivrekar, M. A. Eriksson, and Mark Friesen. *Omnidirectional shuttling to avoid valley excitations in Si/SiGe quantum wells*. 2024. arXiv: 2412.09574.

[3] Yasuo Oda, **Merritt P. Losert**, and Jason P. Kestner. *Suppressing Si Valley Excitation and Valley-Induced Spin Dephasing for Long-Distance Shuttling*. 2024. arXiv: 2411.11695.

[4] Benjamin D. Woods, Merritt P. Losert, Robert Joynt, and Mark Friesen. *g-factor theory of Si/SiGe quantum dots: spin-valley and giant renormalization effects*. 2024. arXiv: 2412.19795.

Publications

[1] Jan Klos, Jan Tröger, Jens Keutgen, **Merritt P. Losert**, Nikolay V. Abrosimov, Joachim Knoch, Hartmut Bracht, Susan N. Coppersmith, Mark Friesen, Oana Cojocaru-Mirédin, Lars R. Schreiber, and Dominique Bougeard. "Atomistic Compositional Details and Their Importance for Spin Qubits in Isotope-Purified Silicon Quantum Wells". *Advanced Science* 11.42 (2024), p. 2407442. URL: https://onlinelibrary.wiley.com/doi/abs/10.1002/advs.202407442.

[2] **Merritt P. Losert***, Max Oberländer*, Julian D. Teske, Mats Volmer, Lars R. Schreiber, Hendrik Bluhm, S.N. Coppersmith, and Mark Friesen. "Strategies for Enhancing Spin-Shuttling Fidelities in Si/SiGe Quantum Wells with Random-Alloy Disorder". *PRX Quantum* 5 (4 Nov. 2024), p. 040322. URL: https://link.aps.org/doi/10.1103/PRXQuantum.5.040322.

[3] **Merritt P. Losert**, M. A. Eriksson, Robert Joynt, Rajib Rahman, Giordano Scappucci, Susan N. Coppersmith, and Mark Friesen. "Practical strategies for enhancing the valley splitting in Si/SiGe quantum wells". *Phys. Rev. B* 108 (2023), p. 125405. URL: https://link.aps.org/doi/10.1103/PhysRevB.108.125405.

[4] J. P. Dodson, H. Ekmel Ercan, J. Corrigan, **Merritt P. Losert**, Nathan Holman, Thomas McJunkin, L. F. Edge, Mark Friesen, S. N. Coppersmith, and M. A. Eriksson. "How Valley-Orbit States in Silicon Quantum Dots Probe Quantum Well Interfaces". *Phys. Rev. Lett.* 128 (2022), p. 146802. URL: https://link.aps.org/doi/10.1103/PhysRevLett.128.146802.

[5] Thomas McJunkin, Benjamin Harpt, Yi Feng, **Merritt P. Losert**, Rajib Rahman, J. P. Dodson, M. A. Wolfe, D. E. Savage, M. G. Lagally, S. N. Coppersmith, Mark Friesen, Robert Joynt, and M. A. Eriksson. "SiGe quantum wells with oscillating Ge concentrations for quantum dot qubits". *Nat. Commun.* 13 (2022), p. 7777. URL: https://doi.org/10.1038/s41467-022-35510-z.

[6] Brian Paquelet Wuetz*, **Merritt P. Losert***, Sebastian Koelling*, Lucas E. A. Stehouwer, Anne-Marije J. Zwerver, Stephan G. J. Philips, Mateusz T. Mądzik, Xiao Xue, Guoji Zheng, Mario Lodari, Sergey V. Amitonov, Nodar Samkharadze, Amir Sammak, Lieven M. K. Vandersypen, Rajib Rahman, Susan N. Coppersmith, Oussama Moutanabbir, Mark Friesen, and Giordano Scappucci. "Atomic fluctuations lifting the energy degeneracy in Si/SiGe quantum dots". *Nat. Commun.* 13 (2022), p. 7730. URL: https://doi.org/10.1038/s41467-022-35458-0.

[7] Brian Paquelet Wuetz, **Merritt P. Losert**, Alberto Tosato, Mario Lodari, Peter L. Bavdaz, Lucas Stehouwer, Payam Amin, James S. Clarke, Susan N. Coppersmith, Amir Sammak, Menno Veldhorst, Mark Friesen, and Giordano Scappucci. "Effect of Quantum Hall Edge Strips on Valley Splitting in Silicon Quantum Wells". *Phys. Rev. Lett.* 125 (2020), p. 186801. URL: https://link.aps.org/doi/10.1103/PhysRevLett.125.186801.

* *denotes equal contribution*

Patents

US Patent Application No. 17/842,988 (under review) Filed 2021

"Silicon-Germanium alloy-based quantum dots with increased alloy disorder and enhanced valley splitting"

Invited talks

Focus workshop on theory for spin qubit shuttling, RWTH Aachen University 2024

"Valley splitting and spin shuttling in Si/SiGe heterostructures"

Contributed and Seminar Talks

Silicon Quantum Electronics Workshop 2024

"Using valley relaxation hotspots to boost spin-shuttling fidelity in Si quantum wells"

Wisconsin Quantum Institute Seminar 2024

"Valley splitting and spin shuttling in Si/SiGe heterostructures"

APS March Meeting 2024

"Valley splitting and spin shuttling in Si/SiGe heterostructures"

Intel Journal Club 2024

"Practical strategies for enhancing the valley splitting in Si/SiGe quantum wells"

Silicon Quantum Electronics Workshop 2023

"Valley splitting and spin shuttling in Si/SiGe heterostructures"

LPS Theory Seminar 2023

"Valley splitting and alloy disorder in Si/SiGe quantum dots"

APS March Meeting 2023

"Valley splitting in the disordered and deterministic regimes"

APS March Meeting 2022

"Increasing the valley splitting in Si/SiGe heterostructures by exploiting atomic concentration fluctuations"

Silicon Quantum Electronics Workshop 2021

"Engineering devices with high valley splitting" (virtual)

Posters

Silicon Quantum Electronics Workshop 2022

"Alloy disorder induced valley splitting in Si/SiGe devices"

ARO Quantum Computing Program Review 2022

"Inclusion of Ge to Si/SiGe quantum wells: Valley splitting, spin-orbit enhancement, and g-factor renormalization" (with Emily Joseph and Ben Woods)

Fellowships and Awards

LQC QuaCR Graduate Fellowship 2022

National Merit Scholarship 2012

Teaching

Galin Education, Tutor (Madison, WI) Sep 2019 - Sep 2024

Tutoring high school and college students in math, physics, ACT, and SAT prep.

UW-Madison, Physics, Teaching Assistant Aug 2018 - May 2019

Introductory Physics 103 and 104

UW-Madison, ECE, Teaching Assistant Fall 2019

ECE 532, "Matrix Methods in Machine Learning"

Dartmouth College, Engineering, Teaching Assistant 2015-2017

ENGS 20, "Introduction to Scientific Computing"

Research Experience

Laboratory for Physical Sciences, Summer Fellow (College Park, MD) Summer 2023

Studying valley splitting in flopping mode qubits

UW Madison, Physics, Research Assistant (Madison, WI) 2019 - Present

Alloy disorder, valley splitting, and spin shuttling in Si/SiGe devices

Dartmouth College, Physics (Hanover, NH) 2014 - 2016

Sophomore Science Scholar (2014), Junior Research Scholar (2015)
Modeling NMR, Dynamic Nuclear Polarization, EDMR in Matlab
Advisor: Chandrasekhar Ramanathan

Other Work Experience

Alarm.com, Software Engineer (Denver, CO) Aug 2017 - Aug 2018

Full stack engineer (Sql Server, C#/.NET) working on ZWave devices, home automation technology and data analytics

Gilt Groupe, Software Engineering Intern (New York, NY) Summer 2016

Summer intern working on Swift frontend and Scala backend

Mentorship

UW Madison Physics, OQI Mentor Summer 2024

Mentored two undergraduate summer researchers working on spin shuttling in the Friesen group

UW Madison Physics, First Year Peer Mentor 2021-2022

Met monthly with a first-year student to help guide them through their first year as a PhD student

Other Activities

MSCR, Volunteer Adaptive Ski Instructor (Madison, WI) 2023

Taught weekly ski lessons at Tyrol Basin for adaptive and non-adaptive skiers of all skill levels

Dartmouth Snowsports, Ski Instructor (Hanover, NH) 2013-2017

Taught weekly ski lessons at the Dartmouth Skiway for beginner and intermediate students

Dartmouth Undergraduate Journal of Science 2013-2016

Author (2013-2016), Assistant Editor (2014-2015), Managing Editor (2015)

Other Interests

Skiing, mountain biking, rock climbing, hiking.
Certifications: PSIA Alpine Level 1, AIARE Avalanche Level 1.