

## CURRICULUM VITAE

JASON KESTNER

### EDUCATION

Ph.D.	2009	University of Michigan, Physics, Advisor: Prof. Luming Duan, Dissertation: <i>Effective Single-Band Hamiltonians for Strongly Interacting Ultracold Fermions in an Optical Lattice</i>
B.S.	2004	Michigan Technological University, Physics
A.S.	2002	Jackson Community College, Jackson, MI

### Experience in Higher Education

2018 – present	UMBC, Associate Professor, Physics
2012 – 2018	UMBC, Assistant Professor, Physics
2009 – 2012	University of Maryland, College Park, Postdoctoral Research Associate, Physics

### Honors Received

2018	Carl S. Weber Excellence in Teaching Award, UMBC College of Natural and Mathematical Sciences
2005	Outstanding First-Year Graduate Student Instructor Award, UM Physics

### Research Support and/or Fellowships

2019-2022	\$300K, NSF/PHY/QIS: “Dynamically Corrected Nonadiabatic Geometric Quantum Logic Gates”
2017-2020	\$1.05M team grant, UMBC subtotal \$390K, ARO/LPS: “Theory of Non-Markovian Noise Correction in Multi-Qubit Gate Operations” [PI Jason Kestner, co-PIs Ed Barnes (VT), Sophia Economou (VT), Sankar Das Sarma (UMD)]
2016-2019	\$210K, NSF/PHY/PIF: “Entangling Qubits with High Fidelity via Nonlocal Echo Sequences”

### Ph.D. Students (Committee Chair)

Fernando Calderon-Vargas	PhD 2016, Physics, current position: postdoctoral research associate, Physics, Virginia Tech
Ralph Colmenar	Physics

### Postdoctoral Researchers

Utkan Gungordu	2017-present
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## PUBLICATIONS, PRESENTATIONS, AND CREATIVE ACHIEVEMENTS

**Publications**

Please check the updated and hyperlinked list of publications and preprints maintained at <http://kestnergroup.umbc.edu/publications/>.

In the list below, the first author is always the primary author. Underlined names are my advisees, students for whom I served as the primary research advisor. Names that are both underlined and bolded are **undergraduate students** for whom I served as the primary research advisor.

**Peer-Reviewed Articles (number: 28)**

1. **A. A. Setser** and **J. P. Kestner**, *Rapid adiabatic gating for capacitively coupled quantum dot hybrid qubits without barrier control*, Phys. Rev. B **99**, 195403 (2019).
2. Utkan Gungordu, **J. P. Kestner**, *Indications of a soft cutoff frequency in the charge noise of a Si/SiGe quantum dot spin qubit*, Phys. Rev. B **99**, 081301(R) (2019).
3. Ralph Colmenar, **J. P. Kestner**, *Stroboscopically robust operating points for entangling operations*, Phys. Rev. A **99**, 012347 (2019).
4. Utkan Gungordu, **J. P. Kestner**, *Pulse sequence designed for robust C-phase gates in SiMOS and Si/SiGe double quantum dots*, Phys. Rev. B **98**, 165301 (2018).
5. **Arman Setser**, M. Goerz, **J. P. Kestner**, *Locally optimized modular perfect entangling sequences*, Phys. Rev. A **97**, 062339 (2018).
6. F. A. Calderon-Vargas, **J. P. Kestner**, *Entanglement dynamics of two Ising-coupled qubits with non-perpendicular local driving fields*, Phys. Rev. B **97**, 125311 (2018).
7. **M. A. Wolfe**, F. A. Calderon-Vargas, **J. P. Kestner**, *Robust operating point for capacitively coupled singlet-triplet qubits*, Phys. Rev. B **96**, 201307(R) (2017).
8. F. A. Calderon-Vargas, **J. P. Kestner**, *Dynamically correcting a CNOT gate for any systematic logical error*, Phys. Rev. Lett. **118**, 150502 (2017).
9. Xiao Li, Edwin Barnes, **J. P. Kestner**, S. Das Sarma, *Intrinsic errors in transporting a single-spin qubit through a double quantum dot*, Phys. Rev. A **96**, 012309 (2017).
10. Yang Song, **J. P. Kestner**, Xin Wang, S. Das Sarma, *Fast control of semiconductor qubits beyond the rotating-wave approximation*, Phys. Rev. A **94**, 012321 (2016).
11. Fernando A. Calderon-Vargas and **J. P. Kestner**, *Directly accessible entangling gates for capacitively coupled singlet-triplet qubits*, Phys. Rev. B **91**, 035301 (2015).
12. Xin Wang, Fernando A. Calderon-Vargas, **Muhed S. Rana**, **J. P. Kestner**, Edwin Barnes, and S. Das Sarma, *Noise-compensating pulses for electrostatically controlled silicon spin qubits*, Phys. Rev. B **90**, 155306 (2014).
13. F. Setiawan, Hoi-Yin Hui, **J. P. Kestner**, Xin Wang, and S. Das Sarma, *Robust Two-Qubit Gates for Exchange-Coupled Qubits*, Phys. Rev. B **89**, 085314 (2014).
14. Xin Wang, Lev S. Bishop, Edwin Barnes, **J. P. Kestner**, and S. Das Sarma, *Robust quantum gates for singlet-triplet spin qubits using composite pulses*, Phys. Rev. A **89**, 022310 (2014).
15. Erik Nielsen, Edwin Barnes, **J. P. Kestner**, and S. Das Sarma, *Six-electron semiconductor double quantum dot qubits*, Phys. Rev. B **88**, 195131 (2013).
16. G. T. Hickman, Xin Wang, **J. P. Kestner**, and S. Das Sarma, *Dynamically corrected gates for an exchange-only qubit*, Phys. Rev. B **88**, 161303(R) (2013).
17. **J. P. Kestner**, Xin Wang, Lev S. Bishop, Edwin Barnes, and S. Das Sarma, *Noise-resistant control for a spin qubit array*, Phys. Rev. Lett. **110**, 140502 (2013).
18. Xin Wang, Lev S. Bishop, **J. P. Kestner**, Edwin Barnes, Kai Sun, and S. Das Sarma, *Composite pulses for robust universal control of singlet-triplet qubits*, Nat. Commun. **3**, 997 (2012).
19. E. Barnes, **J. P. Kestner**, N.T.T. Nguyen, and S. Das Sarma, *Screening of charged impurities with multi-electron singlet-triplet spin qubits in quantum dots*, Phys. Rev. B **84**, 235309 (2011).
20. T. Sedrakyan, **J. P. Kestner**, and S. Das Sarma, *Proposed signature of Anderson localization and correlation-induced delocalization in an N-leg optical lattice*, Phys. Rev. A **84**, 053621 (2011).
21. **J. P. Kestner** and S. Das Sarma, *Proposed spin qubit CNOT gate robust against noisy coupling*, Phys. Rev. A **84**, 012315 (2011).

22. **J. P. Kestner**, Bin Wang, Jay D. Sau, and S. Das Sarma, *Prediction of a Novel Topological “Haldane Liquid” Phase in One-Dimensional Cold Polar Molecular Lattice*, Phys. Rev. B **83**, 174409 (2011).
23. **J. P. Kestner** and S. Das Sarma, *Compressibility, zero sound, and effective mass of a fermionic dipolar gas at finite temperature*, Phys. Rev. A **82**, 033608 (2010).
24. **J. P. Kestner** and L.-M. Duan, *Anharmonicity induced resonances for ultracold atoms and their detection*, New J. Phys. **12**, 053016 (2010).
25. **J. P. Kestner** and L.-M. Duan, *Effective single-band models for strongly interacting fermions in an optical lattice*, Phys. Rev. A **81**, 043618 (2010).
26. **J. P. Kestner** and L.-M. Duan, *Effective low-dimensional Hamiltonian for strongly interacting atoms in a transverse trap*, Phys. Rev. A **76**, 063610 (2007). [See also accompanying erratum.]
27. **J. P. Kestner** and L.-M. Duan, *Level crossing in the three-body problem for strongly interacting fermions in a harmonic trap*, Phys. Rev. A **76**, 033611 (2007).
28. **J. P. Kestner** and L.-M. Duan, *Conditions of low dimensionality for strongly interacting atoms under a transverse trap*, Phys. Rev. A **74**, 053606 (2006).

#### Articles Submitted or In Preparation (number: 1)

##### Submitted for publication

1. Utkan Güngördü, **J. P. Kestner**, *Analytically parameterized solutions for robust quantum control using smooth pulses*, arXiv:1906.12289, submitted to Phys. Rev. A, (2019).

#### Presentations (total: 58)

In the list below, the first author is the presenter unless otherwise indicated. Underlined names are my advisees, students or postdocs for whom I served as the primary research advisor. Names that are both underlined and bolded are undergraduate students for whom I served as the primary research advisor.

#### Conference/Poster Presentations (Juried/Refereed) (number: 34)

1. Ralph Colmenar, **Jason Kestner**, *Construction of minimal unitary 2-designs using Monte Carlo simulations* (poster), Assessing Performance of Quantum Computers 2019, Denver, CO, September 2019.
2. Utkan Gungordu, **Jason Kestner**, *Robust implementation of one-qubit gates despite always-on exchange coupling in silicon double quantum dots*, APS March Meeting, Boston, MA, March 2019.
3. **Arman Setser**, **Jason Kestner**, *Detuning dependence of capacitive coupling for quantum dot hybrid qubits*, APS March Meeting, Boston, MA, March 2019.
4. **Jason Kestner**, *Dynamically corrected gates for spin qubits*, Invited Session talk, APS March Meeting, Los Angeles, CA, March 2018.
5. Utkan Gungordu, **Jason Kestner**, *A pulse sequence designed for robust CNOT gates in SiMOS quantum dots*, APS March Meeting, Los Angeles, CA, March 2018.
6. **Michael Wolfe**, Pascal Cerfontaine, Fernando Calderon-Vargas, **Jason Kestner**, Hendrik Bluhm, *Simulating High-Fidelity Two-Qubit Gates with Singlet-Triplet Qubits Generated by Capacitive Coupling and Interqubit Exchange Interaction*, APS March Meeting, Los Angeles, CA, March 2018.
7. Ralph Colmenar, **Jason Kestner**, *Stroboscopically Robust Operating Points on Ising-Coupled Qubits*, APS March Meeting, Los Angeles, CA, March 2018.
8. **Arman Setser**, Michael Goerz, **Jason Kestner**, *Local Gradient Optimization of Modular Entangling Sequences*, APS March Meeting, Los Angeles, CA, March 2018
9. **Michael Wolfe**, **Jason Kestner**, *Robust operating point for capacitively coupled singlet-triplet qubits*, APS March Meeting, New Orleans, LA, March 2017.

10. Fernando Calderon-Vargas, **Jason Kestner**, *Dynamically correcting a CNOT gate for any systematic logical error*, APS March Meeting, New Orleans, LA, March 2017.
11. **Jason Kestner**, *Joint measurement of electron spin qubits via proximal conductance*, APS March Meeting, Baltimore, MD, March 2016.
12. Fernando Calderon-Vargas, **Jason Kestner**, *Error-reducing sequence for capacitively coupled singlet-triplet qubits*, APS March Meeting, Baltimore, MD, March 2016.
13. **Michael Wolfe**, **Jason Kestner**, *Simulating Entanglement Dynamics of Singlet-Triplet Qubits Coupled to a Classical Transmission Line Resonator*, APS March Meeting, Baltimore, MD, March 2016.
14. Fernando Calderon-Vargas, **Jason Kestner** (presenter), *Directly accessible entangling gates for capacitively coupled singlet-triplet qubits*, APS March Meeting, San Antonio, TX, March 2015.
15. **Michael Wolfe**, **Shawna Chisholm**, **Jason Kestner**, *Entanglement dynamics of capacitively coupled spin qubits in the presence of stray inductance*, APS March Meeting, San Antonio, TX, March 2015.
16. FNU Setiawan, Hoi-Yin Hui, **Jason Kestner**, Xin Wang, *Robust Two-Qubit Gates for Exchange-Coupled Exchange-Only Qubits*, APS March Meeting, Denver, CO, March 2014.
17. **Muhed Rana**, **Jason Kestner**, Fernando Calderon, *Optimizing efficiency of noise cancelling in a singlet-triplet spin-qubit array*, APS March Meeting, Denver, CO, March 2014.
18. Fernando Calderon, **Jason Kestner**, *Theoretical Characterization of Nonlocal Two-qubit Operations for Electrostatically Coupled Singlet-Triplet Qubits*, APS March Meeting, Denver, CO, March 2014.
19. Erik Nielsen, Edwin Barnes, **Jason Kestner**, *Design considerations for multielectron double quantum dot qubits in silicon*, APS March Meeting, Denver, CO, March 2014.
20. **Jason Kestner**, Edwin Barnes, Xin Wang, Lev Bishop, Sankar Das Sarma, *Composite multi-qubit gates dynamically corrected against charge noise and magnetic field noise for singlet-triplet qubits*, APS March Meeting, Baltimore, MD, March 2013.
21. Xin Wang, Edwin Barnes, **Jason P. Kestner**, Lev S. Bishop, Sankar Das Sarma, *Composite pulses robust against charge noise and magnetic field noise for universal control of a singlet-triplet qubit*, APS March Meeting, Baltimore, MD, March 2013.
22. Garrett Hickman and **Jason Kestner**, *Dynamically Corrected Pulse Sequences for the Exchange Only Qubit*, APS March Meeting, Baltimore, MD, March 2013.
23. Erik Nielsen, **Jason Kestner**, Edwin Barnes, Sankar Das Sarma, *Multi-electron double quantum dot spin qubits*, APS March Meeting, Baltimore, MD, March 2013.
24. **Jason Kestner**, Edwin Barnes, Nga Nguyen, Sankar Das Sarma, *Screening of charged impurities with multi-electron singlet-triplet spin qubits in quantum dots*, APS March Meeting, Boston, MA, March 2012.
25. Xin Wang, Edwin Barnes, Lev S. Bishop, **Jason P. Kestner**, Kai Sun, Sankar Das Sarma, *Composite pulse sequences for Z-rotations robust against small magnetic field gradient in singlet-triplet qubits*, APS March Meeting, Boston, MA, March 2012.
26. Lev S. Bishop, Xin Wang, Edwin Barnes, **Jason P. Kestner**, Kai Sun, Sankar Das Sarma, *Composite pulse sequences for robust universal control of singlet-triplet qubits*, APS March Meeting, Boston, MA, March 2012.
27. Tigran Sedrakyan, **Jason Kestner**, Sankar Das Sarma, *Anderson localization and correlation-induced delocalization in N-leg optical lattices* (poster), APS March Meeting, Boston, MA, March 2012.
28. **Jason Kestner**, Bin Wang, Jay Sau, Sankar Das Sarma, *The Prediction of a Gapless Topological "Haldane Liquid" Phase in a One-Dimensional Cold Polar Molecular Lattice*, APS March Meeting, Dallas, TX, March 2011.
29. Sankar Das Sarma, **Jason Kestner** (presenter), *A proposed all-electrical spin qubit CNOT gate robust against charge noise*, APS March Meeting, Dallas, TX, March 2011.
30. **Jason Kestner**, Sankar Das Sarma, *Nonmonotonic temperature dependence of dipolar compressibility*, APS March Meeting, Portland, OR, March 2010.

31. **Jason Kestner**, Luming Duan, *General Hubbard Model for Fermions in an Optical Lattice*, APS March Meeting, Pittsburgh, PA, March 2009.
32. **Jason Kestner**, Luming Duan, *Lattice model for strongly interacting fermions in an optical lattice*, DAMOP Meeting, Charlottesville, VA, May 2009.
33. **Jason Kestner**, Luming Duan, *Effective Low-Dimensional Hamiltonian for Strongly Interacting Atoms in a Transverse Trap*, DAMOP Meeting, State College, PA, May 2008.
34. **Jason Kestner**, Luming Duan, *Effective Hamiltonian for Strongly Interacting Atoms in Low Dimensions*, DAMOP Meeting, Knoxville TN, May 2006.

### Other Professional Presentations (number: 29)

Jason Kestner was the presenter unless indicated otherwise. All of the below are invited talks.

#### Colloquia (number: 2)

1. *Controlling Quantum Dot Spin Qubits*, University of Maryland Condensed Matter Colloquium, College Park, MD, September 2012.
2. *Controlling Quantum Dot Spin Qubits*, UMBC Physics Departmental Colloquium, Baltimore, MD, February 2012.

#### Seminars (number: 12)

1. *Modular dynamical decoupling for entangling operations*, Centre for Engineered Quantum Systems, University of Sydney, Sydney, Australia, March 2019.
2. *Dynamical correction of entangling gates*, Johns Hopkins University Applied Physics Laboratory Research and Exploratory Development Department, Laurel, MD, December 2018.
3. *Modular pulse sequences for entangling operations*, Condensed Matter Seminar, Virginia Tech, Blacksburg, VA, October 2016.
4. *Dynamically corrected entangling gates for spin qubits*, R.G. Herb Condensed Matter Seminar, U. Wisconsin-Madison, Madison, WI, April 2016.
5. *Pulse gating schemes for spin qubits*, NORDITA, Stockholm, Sweden, August 2015.
6. *Pulse gating schemes for spin qubits*, QDev seminar, Niels Bohr Institute, Copenhagen, Denmark, August 2015.
7. *Dynamical correction of two exchange-coupled spin qubits (and capacitive entanglement)*, CMTC Symposium, College Park, MD, November 2014.
8. *Pulse sequences for exchange-coupled spin qubits*, Laboratory for Physical Sciences, College Park, MD, September 2014.
9. *Screening of charged impurities with multi-electron singlet-triplet spin qubits in quantum dots*, CMTC Symposium, College Park, MD, October 2011.
10. *A prediction of a novel topological "Haldane liquid" phase of ultracold polar molecules in a 1D lattice*, CMTC Symposium, College Park, MD, November 2010.
11. *Effective single-band Hamiltonians for fermions in an optical lattice near a Feshbach resonance*, CMTC Symposium, College Park, MD, October 2009.
12. *Ground State of Atoms Across a Feshbach Resonance in a Low-D Trap*, FOCUS Seminar Student Mini-talk, Ann Arbor, MI, January 2007.

#### Workshops/Summer Schools (number: 6)

1. *Modular dynamical decoupling for entangling operations*, 5th International Workshop on Entanglement, Decoherence, and Quantum Control, Hoboken, NJ, October 2018.
2. *Great Teachers Talk About Teaching* (panelist), Faculty Development Center, UMBC, September 2018.
3. *Lecture Series on Quantum Computation in Condensed Matter Systems*, NORDITA Masterclass in Physics 2015, Ishoj Strand, Denmark, August 2015.
4. *Dynamical gate correction with restricted control for spin qubits*, 4th International Workshop on Entanglement, Decoherence, and Quantum Control, Buffalo, NY, October 2014.
5. *Two-qubit composite pulse sequences for spin qubits*, Kavli Institute for Theoretical Physics China workshop “Quantum Computing with Electron Spin Qubits,” Beijing, China, July 2014.
6. *Effective Low-Dimensional Hamiltonian for Strongly Interacting Ultracold Gas*, Michigan Quantum Summer School, Ann Arbor, MI, June 2008.

#### **Program Reviews (number: 9)**

1. **Jason Kestner**, Ed Barnes, Sophia Economou, Sankar Das Sarma, *Theory of non-Markovian noise correction in multi-qubit gate operations*, ARO/LPS Quantum Computing Program Review, Annapolis, MD, August 2019.
2. **Jason Kestner**, Ed Barnes, Sophia Economou, Sankar Das Sarma, *Theory of non-Markovian noise correction in multi-qubit gate operations*, ARO/LPS Quantum Computing Program Review, Denver, CO, August 2018.
3. **Jason Kestner**, Ed Barnes (presenter), Sophia Economou, Sankar Das Sarma, *Theory of non-Markovian noise correction in multi-qubit gate operations*, ARO/LPS Quantum Computing Program Review, San Diego, CA, August 2017.
4. **Jason Kestner**, FNU Setiawan, Hoi-Yin Hui, Xin Wang, Sankar Das Sarma, *Robust Two-Qubit Gates for Exchange-Coupled Qubits*, IARPA Multi-Qubit Coherent Operations Phase III Review Meeting, Boston, MA, April 2014.
5. **Jason Kestner**, Xin Wang, Lev Bishop, Edwin Barnes, and Sankar Das Sarma, *Noise-resistant control for a spin qubit array* (poster), ARO/NSA Quantum Computing and Quantum Algorithms Program Review, San Diego, CA, August 2013.
6. **Jason Kestner**, *An effective spin-one Hamiltonian for polar molecules with a gapless 1D topological phase*, AFOSR Ultracold Polar Molecules MURI Review Meeting, MIT, Cambridge, MA, September 2011.
7. **Jason Kestner** and Sankar Das Sarma, *Proposed spin qubit CNOT gate robust against noisy coupling* (poster), ARO/NSA Quantum Computing and Quantum Algorithms Program Review, Sydney, Australia, August 2011.
8. **Jason Kestner**, *The Prediction of a Gapless Topological “Haldane Liquid” Phase in a One-Dimensional Cold Polar Molecular Lattice*, DARPA Optical Lattice Emulator Program Review, Vail, CO, June 2011.
9. **Jason Kestner** and Sankar Das Sarma, *Compressibility and a topological phase in low-dimensional polar fermions*, AFOSR Ultracold Polar Molecules MURI Review Meeting, Boulder, CO, October 2010.

#### **Service to the Community**

2018, UMBC English Language Institute volunteer conversation partner (1 hour/week).

2015 – 2016, research mentor for Kevin Huang, G&T Program, Centennial High School, Ellicott City MD  
This project won multiple awards: 2016 Baltimore Science Fair Grand Prize winner, Physical section; 2016 Siemens

Competition in Math, Science & Technology Semifinalist; 2017 Regeneron Science Talent Search Top 300 Scholar, \$2000 prize.

**Service to the Profession**

Referee for journals: Physical Review Letters (2011-), Physical Review A (2010-), Physical Review B (2011-), New Journal of Physics (2010-), Journal of Physics: Condensed Matter (2014-), Physical Review Applied (2015-), Nature Communications (2015-), Quantum Information Processing (2015-), Nanoscale (2015-), Physical Review X (2017-), npj Quantum Information (2017-), IEEE Access (2019-).

Referee for funding agencies: National Science Foundation, Agence Nationale de la Recherche France, Natural Sciences and Engineering Research Council of Canada.

Session chair for Kavli Institute for Theoretical Physics China workshop “Quantum Computing with Electron Spin Qubits,” Beijing, 2014.