

Curriculum Vitae : Yun-Pil Shim, Ph.D.

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Contact Information

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Education

The University of Texas at Austin (USA)	Ph.D. in Physics (2006)
Seoul National University (Rep. of Korea)	B.S. in Physics (2000)

Appointments

09/2020 ~ present	Assistant Professor Department of Physics, The University of Texas at El Paso El Paso, TX, USA
03/2016 ~ 08/2020	Faculty Specialist Department of Physics, University of Maryland & Laboratory for Physical Sciences College Park, MD, USA
11/2012 ~ 03/2016	Research Associate Department of Physics, University of Maryland & Laboratory for Physical Sciences College Park, MD, USA
09/2009 ~ 11/2012	Research Associate Department of Physics, University of Wisconsin-Madison Madison, WI, USA
12/2006 ~ 09/2009	CIFAR-IMS Research Associate National Research Council of Canada Ottawa, ON, Canada

Professional Membership

American Physical Society (APS)
APS Division of Quantum Information (DQI)
Korean-American Scientists and Engineers Association (KSEA)

Professional Activities

Journal Reviewer:
Nature Journals, Physical Review Journals, Nano Letters, Solid State
Communications, Journal of Physics: Condensed Matter, National Science
Review, Physical Status Solidi B
Grant Reviewer:
AFOSR, NSERC, NSF

Main Research Areas

Theoretical/computational condensed matter physics
Quantum information and computation in condensed matter systems
Quantum algorithms for Noisy Intermediate-Scale Quantum (NISQ) systems

Research Support / Funding

5. Project Title: *Quantum Dot Spin Qubits and Superconducting Qubits in Semiconductor Platforms*
PI: Yun-Pil Shim (PI)
Sponsor: Army Research Office (ARO) - LPS Qubit Collaboratory (LQC)
Project Period: 03/01/2024 – 02/28/2027
Award Amount: \$1,065,385

4. Project Title: *Additive Manufacturing for Directed Energy*
Pis: Robert Roberts (PI), Yun-Pil Shim (co-PI), Ahmed El-Gendy (co-PI), Mark Pederson (co-PI), Raymond Rumpf (co-PI), Tunna Baruah (co-PI), Jaesung Lee (co-PI)
Sponsor: Air Force Office of Scientific Research (AFOSR)
Project Period: 08/15/2023 - 08/14/2026
Award Amount: Total \$1,284,622

3. Project Title: *LEAPS-MPS: Multiqubit Entangling Gates for Solid-State Qubit Systems*
PI: Yun-Pil Shim (PI)
Sponsor: National Science Foundation (NSF)
Project Period: 08/01/2023 - 07/31/2025
Award Amount: \$250,000

2. Project Title: *Development of induced quantum dot spin qubits and superconducting qubits in semiconductors*
PI: Yun-Pil Shim (PI)
Sponsor: Army Research Office (ARO) - LPS Qubit Collaboratory (LQC)
Project Period: 01/25/2022 – 01/24/2024
Award Amount: \$200,000

1. Project Title: *Multiqubit gates for creating highly entangled quantum states*
PI: Yun-Pil Shim (PI)
Sponsor: University Research Institute Grant (internal)
Project Period: 01/16/2022 - 08/31/2022
Award Amount: \$5,000

Selected Publications

18. Omadillo Abdurazakov, Chunqiang Li, and **Yun-Pil Shim**, *Formation of dark excitons in monolayer transition metal dichalcogenides by a vortex beam: optical selection rules*, Physical Review B **108**, 125435 (2023).
17. **Yun-Pil Shim**, *Pauli Spin Blockade in a Resonant Triple Quantum Dot Molecule*, Journal of Applied Physics **132**, 064402 (2022).
16. Daniel L. Campbell, **Yun-Pil Shim**, Bharath Kannan, Roni Winik, David K. Kim, Alexander Melville, Bethany M. Niedzielski, Jonilyn L. Yoder, Charles Tahan, Simon Gustavsson, and Will Oliver, *Universal Nonadiabatic Control of Small-Gap Superconducting Qubits*, Physical Review X **10**, 041051 (2020).
15. **Yun-Pil Shim**, Rusko Ruskov, Hilary M. Hurst, and Charles Tahan, *Induced quantum dot probe for material characterization*, Applied Physics Letters **114**, 152105 (2019).
14. **Yun-Pil Shim** and Charles Tahan, *Barrier versus tilt exchange gate operations in spin-based quantum computing*, Physical Review B **97**, 155402 (2018).
13. **Yun-Pil Shim** and Charles Tahan, *Charge-noise-insensitive gate operations for always-on exchange-only qubits*, Physical Review B **93**, 121410(R) (2016).
12. **Yun-Pil Shim** and Charles Tahan, *Semiconductor-inspired design principles for superconducting quantum computing*, Nature Communications **7**, 11059 (2016).
11. **Yun-Pil Shim** and Charles Tahan, *Superconducting-semiconductor quantum devices: from qubits to particle detectors*, IEEE Journal of Selected Topics in Quantum Electronics **21**, 9100209 (2015).
10. **Yun-Pil Shim** and Charles Tahan, *Bottom-up superconducting and Josephson junction devices inside a group-IV semiconductor*, Nature Communications **5**, 4225 (2014).
9. Chang-Yu Hsieh, **Yun-Pil Shim**, Marek Korkusinski, and Pawel Hawrylak, *Physics of lateral triple quantum dot molecules with controlled electron numbers*, Reports on Progress in Physics **75**, 114501 (2012).
8. Zhan Shi, C. B. Simmons, J. R. Prance, John King Gamble, Teck Seng Koh, **Yun-Pil Shim**, Xuedong Hu, D. E. Savage, M. G. Lagally, M. A. Eriksson, Mark Friesen, and S. N. Coppersmith, *Fast Hybrid Silicon Double-Quantum-Dot Qubit*, Physical Review Letters **108**, 140503 (2012).
7. **Yun-Pil Shim**, Sangchul Oh, Xuedong Hu, and Mark Friesen, *Controllable anisotropic exchange coupling between spin qubits in quantum dots*, Physical Review Letters **106**, 180503 (2011).
6. **Y.-P. Shim**, A. Sharma, C.-Y. Hsieh, and P. Hawrylak, *Artificial Haldane gap material on a semiconductor chip*, Solid State Communications **105**, 2065 (2010).
5. **Y.-P. Shim**, F. Delgado, and P. Hawrylak, *Tunneling spectroscopy of spin-selective Aharonov-Bohm oscillations in lateral triple quantum dot molecules*, Physical Review B **80**, 115305 (2009).
4. **Y.-P. Shim** and A. H. MacDonald, *Spin-orbit interactions in bilayer excitonic condensate ferromagnets*, Physical Review B **79**, 235329 (2009).
3. F. Delgado, **Y.-P. Shim**, M. Korkusinski, L. Gaudreau, S. A. Studenikin, A. S. Sachrajda, and P. Hawrylak, *Spin-selective Aharonov-Bohm oscillations in a lateral triple quantum dot*, Physical Review Letters **101**, 226810 (2008).

2. **Yun-Pil Shim** and Pawel Hawrylak, *Gate-controlled spin-spin interactions in lateral quantum dot molecules*, *Physical Review B* **78**, 165317 (2008).
1. **Y.-P. Shim**, R. A. Duine, and A. H. MacDonald, *Fulde-Ferrell-Larkin-Ovchinnikov vortex lattice states in fermionic cold-atom systems*, *Physical Review A* **74**, 053602 (2006).

Patents

3. *System for induced quantum dots for material characterization and quantum computers*, Charles George Tahan, Rousko T. Hristov, Yun-Pil Shim, Hilary Hurst, US patent 11444184B1 (2022)
2. *Systems, methods, and devices for noise-insensitive qubit gate operations*, Yun-Pil Shim and Charles George Tahan, US Patent 10755191 (2020).
1. *Microwave-free control of a superconductor-based quantum computer*, Yun-Pil Shim and Charles George Tahan, US Patent 9996801 (2018).

Selected Presentations

Seminars/Colloquia

21. *Semiconductor Quantum Dot Spin Qubits: Electron, Hole, and More*, Samsung Advanced Institute of Technology, July 04, 2023.
20. *Quantum Computing and Quantum Technology*, Gachon University, Seongnam, Korea, June 29, 2023.
19. *Principles of Quantum Computers*, Korea Institute for Advanced Study, Seoul, Korea, June 22, 2023.
18. *Optimal Qubit and Quantum Gate Schemes for Semiconductor Spin Qubits*, (Virtual) Colloquium, San Jose State University, San Jose, CA, USA, April 28, 2022.
17. *Encoded qubit approach to superconducting quantum computing*, The University of Texas at El Paso, El Paso, TX, USA, January 27, 2020.
16. *Encoded qubit approach to superconducting quantum computing*, University of Rhode Island, Kingston, RI, USA, January 22, 2020.
15. *Composite qubit approach to superconducting quantum computing*, Korea Research Institute of Standards and Science (KRISS), Daejeon, South Korea, May 22, 2019.
14. *Composite qubit approach to superconducting quantum computing*, Electronics and Telecommunications Research Institute (ETRI), Daejeon, South Korea, May 22, 2019.
13. *Composite qubit approach to superconducting quantum computing*,

- Colloquium, Binghamton University – The State University of New York, Binghamton, NY, USA, February 18, 2019.
12. *Semiconductor quantum dot spin qubits and mitigating charge noise on exchange interaction*, Korea Research Institute of Standards and Science (KRISS), Daejeon, South Korea, May 2, 2018.
 11. *Semiconductor quantum dot spin qubits and mitigating charge noise on exchange interaction*, Center for Quantum Nano Science, Ewha Womans University, Seoul, South Korea, April 30, 2018.
 10. *Quantum Computing in Solid State Devices - Superconducting and semiconductor qubits*, Korea Research Institute of Standards and Science (KRISS), Daejeon, South Korea, May 24, 2017.
 9. *New designs for superconducting and semiconductor qubits by learning from each other*, LPS Seminar, Laboratory for Physical Sciences, College Park, MD, USA, April 27, 2016.
 8. *Superconducting semiconductors and their applications*, Seminar, University of Ottawa, Ottawa, ON, Canada, November 19, 2014.
 7. *Superconducting and Josephson junction devices inside a Group-IV semiconductor*, LPS QC Seminar, Laboratory for Physical Sciences, College Park, MD, USA, November 1, 2013.
 6. *Quantum Computation on a Spin Chain*, Laboratory for Physical Sciences, College Park, MD, USA, July 23, 2012.
 5. *Engineering non-Heisenberg interactions between quantum dot spin qubits*, National Research Council of Canada, Ottawa, ON, Canada, August 05, 2010.
 4. *Electronic, spin, and transport properties of a triple quantum dot molecule*, Institute for Quantum Computing at University of Waterloo, Waterloo, ON, Canada, May 08, 2009.
 3. *Electronic, spin, and transport properties of a triple quantum dot molecule*, University of Wisconsin-Madison, Madison, WI, USA, May 06, 2009.
 2. *Ferromagnetic Excitonic Condensation*, National Research Council of Canada, Ottawa, ON, Canada, March 16, 2007.
 1. *Ferromagnetic Excitonic Condensation*, University of Oklahoma, Norman, OK, USA, July 21, 2006.

Lectures

7. *Encoded qubit with spin qubits*, (virtual) lecture given at LPS QD meeting, College Park, MD, USA, May 15, 2023.
6. *Quantum Mechanics and Quantum Computing*, (virtual) lecture given at Daegu Kyeongbuk Institute of Science and Technology (DGIST), Daegu, South Korea, June 07, 2022.
5. *Lectures on Quantum Computation and Superconducting Qubits*, (virtual) lectures given at Gwangju Institute of Science and Technology (GIST), Gwangju, South Korea, August 10-14, 2020.
4. *Superconducting Qubit based Quantum Computing I & II*, lectures given at the 8th School of Mesoscopic Physics, Pohang, South Korea, May 24, 2019.

3. *Basic theory of quantum dot devices*, lecture given at Seoul National University, Seoul, South Korea, May 31, 2017.
2. *Introduction to Quantum Computation*, lecture given at Korea Research Institute of Standards and Science (KRISS), Daejeon, South Korea, May 29, 2017.
1. *Quantum dot basics, quantum manipulation and measurements in semiconductors*, Lectures given at the 6th School of Mesoscopic Physics, Pohang, South Korea, May 25, 2017.

Invited Conference presentations

9. *Creating Excitons with Structured Light in Transition Metal Dichalcogenides*, invited talk, QC2DM 2022, Ottawa, ON, Canada, May 27, 2022.
8. *Semiconductor quantum dot spin qubits and encoded qubits*, invited talk, ACS Spring Meeting, San Diego, CA, USA, March 23, 2022.
7. *Efficient quantum circuit implementation on superconducting quantum computing devices*, invited talk, KAIST SRC Winter Workshop (virtual), January 24, 2022.
6. *High fidelity encoded gate operations for composite superconducting qubit*, invited talk, KPS Spring Meeting (virtual), July 14, 2020.
5. *Composite qubit approach to superconducting quantum computing*, invited talk, KSEA VWMRC 2020 (virtual), May 09, 2020.
4. *Mitigating charge noise in exchange gate operations between spin qubits*, Invited talk, KPS Spring Meeting, Daejeon, South Korea, April, 26, 2018.
3. *Semiconductor-inspired superconducting quantum computing*, Invited talk, APS March meeting, Baltimore, MD, USA, March 16, 2016.
2. *Semiconductor-inspired superconducting quantum computing*, invited talk, Joint AKPA-KPS session in APS March Meeting, Baltimore, MD, USA, March 13, 2016.
1. *Bottom-up superconducting and Josephson junction devices and qubits inside a group-IV semiconductor*, Invited talk, APS March meeting, Denver, CO, USA, March 4, 2014.