Alexey V. Gorshkov

gorshkov@umd.edu
http://groups.jqi.umd.edu/gorshkov

Education

Mar '10 **Ph.D. Physics**, *Harvard University*, Thesis: Novel Systems and Methods for Quantum Communication, Quantum Computation, and Quantum Simulation, Advisor: Mikhail D. Lukin.

Jun '06 **A.M. (Master of Arts) Physics**, *Harvard University*.

Jun '04 **A.B. (Bachelor of Arts) Physics and Mathematics**, *Harvard University*.
Summa Cum Laude

Appointments

Oct '14– **Fellow**, *Joint Center for Quantum Information and Computer Science (QuICS)*.

Aug '13– **Fellow**, *Joint Quantum Institute (JQI)*.

Aug '13– **Physicist**, *Quantum Measurement Division, National Institute of Standards and Technology (NIST)*.

Oct '23– **Adjunct Professor**, *University of Maryland Institute for Advanced Computer Studies (UMIACS)*.

Sep '23– **Adjunct Professor**, *University of Maryland Department of Physics*.

Oct '20–Oct '23 **Adjunct Associate Professor**, *University of Maryland Institute for Advanced Computer Studies (UMIACS)*.

Jan '19–Sep '23 **Adjunct Associate Professor**, *University of Maryland Department of Physics*.

Aug '13–Dec '18 **Adjunct Assistant Professor**, *University of Maryland Department of Physics*.

Sep '10–Aug '13 **Lee A. DuBridge Postdoctoral Scholar in Theoretical Physics**, *Institute for Quantum Information and Matter (IQIM) at the California Institute of Technology*.

Jan '10–Aug '10 **Postdoctoral Fellow in Physics**, *Harvard University Physics Department*.

Teaching Experience

Fall 2015 **Atomic and Optical Physics I**.
Co-teaching with Ian Spielman at the University of Maryland Department of Physics

Fall 2014 **Atomic and Optical Physics I**.
Co-teaching with Ian Spielman at the University of Maryland Department of Physics

Fall 2008 **Topics in the Physics of Quantum Information**.
Teaching fellow (unofficial) at the Harvard University Department of Physics

Fall 2007 **Modern Atomic and Optical Physics**.
Teaching fellow at the Harvard University Department of Physics
Earned a Certificate of Distinction in Teaching

Spring 2002 **Multivariable Calculus**.
Course assistant at the Harvard University Department of Mathematics

Fall 2001 **Linear Algebra**.
Course assistant at the Harvard University Department of Mathematics

Honors and Awards

'24 Blavatnik National Awards for Young Scientists Finalist in Physical Sciences & Engineering. *Citation: For advancing the design of large interacting quantum systems through pioneering research at the intersection of quantum physics and information science with groundbreaking implications for quantum computers, sensors, and networks.*

'24 IEEE Photonics Society Quantum Electronics Award. *Citation: For pioneering contributions to understanding, design, and control of interacting quantum systems, with applications including quantum computers, sensors, and networks.*

'23 Samuel Wesley Stratton Award, considered to be NIST's highest award for fundamental research. *Citation: For original, fundamental contributions to the understanding, design, and control of large interacting quantum systems, with applications that include quantum computers, quantum sensors, and quantum networks.*

'22 Optica Fellow. *Citation: For fundamental contributions to the understanding and control of large, interacting quantum systems, with applications including quantum-computing, sensing, and networks.*

'22 Washington Academy of Sciences Excellence in Research Award in Physical and Information Sciences. *Citation: In recognition for pioneering, fundamental contributions to the understanding, design, and control of large, interacting quantum systems, with applications including quantum computers, quantum sensors, and quantum networks.*

'20 Arthur S. Flemming Award

'20 Fellow of the American Physical Society. *Citation: For contributions to the understanding, design, and control of quantum many-body atomic, molecular, and optical systems and their applications to phase transitions, entanglement generation and propagation, synthetic magnetism, and quantum memory and simulation.*

'19 Nominated to Full Membership in Sigma Xi, The Scientific Research Honor Society. Accepted nomination in 2025.

'19 Presidential Early Career Award for Scientists and Engineers (PECASE). *Citation: For pushing the frontiers of quantum science through groundbreaking research, including manipulating individual light particles to strongly interact—something they do not naturally do, and which was recognized by "Physics World" as one of the top ten breakthroughs of 2013.*

'18 IUPAP (International Union of Pure and Applied Physics) Young Scientist Prize in Atomic, Molecular, and Optical Physics. *Citation: For his outstanding contributions on quantum properties of interacting cold atoms, cold dipolar matter, quantum optics, quantum transduction, and quantum simulations.*

'21 Nominated for the Graduate Faculty Mentor of the Year Award at the University of Maryland (one of 22 nominees out of more than 1500 faculty members)

'22 Fellow of the Washington Academy of Sciences

'10–'13 Lee A. DuBridge Postdoctoral Fellowship from the California Institute of Technology

'11 One of four finalists for the 2011 Thesis Prize from the APS Division of AMO Physics

'08 Graduate Society Merit Fellowship (John Parker Bequest Scholarship)

'08 Gertrude and Maurice Goldhaber Prize to an outstanding graduate student

'07 Certificate of Distinction in Teaching

'04–'07 National Science Foundation Graduate Research Fellowship

'05 Robbins Prize from the Harvard University Physics Department

'04 Dr. Jack T. Sanderson Memorial Prize from Harvard College for excellence in the study of physics

'03 Elected to Harvard's chapter of Phi Beta Kappa in the fall of senior year (one of the top 72 students out of the senior class of about 2000)

'02–'03 Harvard College Scholarship for superior academic achievement

'00–'02 John Harvard Scholarship for academic achievement of the highest distinction

'01 Detur Prize from Harvard College for very high academic standing

'97 2nd place in the All-Russian Mathematics Olympiad

Press (reference number corresponds to the publications list below)

'13 Our work on the realization of attractive and massive photons was chosen by Physics World as one of ten breakthroughs of 2013. It was also featured by CNN, the Guardian, and numerous other news media [41].

'17 Our work on the observation of a dynamical phase transition with a 53-qubit quantum simulator was featured by Gizmodo, International Business Times, Discover Magazine, Science Daily, and numerous other news media [83].

'18 Our work on the observation of three-photon bound states in a quantum nonlinear medium was featured by Newsweek and numerous other news media [84].

'13 Our work on the use of an optical clock to study spin models was featured by the New Scientist, ElectronicsWeekly.com, Science World Report, and other news media [38].

'25 Our work on the realization of 1D anyons was featured in Physics Today [183].

'25 Our work [205] on local implementations of quantum LDPC codes was featured in a Physics Synopsis, chosen to be on the cover of PRX Quantum (based on the scientific excellence and prospects of generating significant interest in the quantum community), and selected for the International Year of Quantum Collection (described as a "handful of recent contributions that the PRX Quantum editorial team believes will help shape the next decade of quantum science and technology").

'21 Our work on optimal state transfer and entanglement generation in power-law interacting systems was featured by phys.org, insidequantumtechnology.com, acm.org and numerous other news media [139].

'20 Our work on symmetry breaking and error correction in open quantum systems was featured by theregister.com, qubitreport.com, medium.com and numerous other news media [137].

'20 Our work on simulating hyperbolic space was selected as an Editors' Suggestion and was featured in a Physics Synopsis and by Phys.org, SciTechDaily, and numerous other news media [116].

'15 Our work on nearly linear light cones in long-range interacting quantum systems was featured by Science Daily, Nanotechnology Now, Phys.org, Scientific Computing, R&D Magazine, the ECN Magazine, and other news media [49].

'15 Our work on Coulomb bound states of strongly interacting photons was selected as an Editors' Suggestion and was featured by Optics & Photonics News (OPN), photonics.com, and numerous other news media [52].

'14 Our experimental work [44] on the non-local propagation of correlations and our theoretical work [45] on the persistence of locality in systems with power-law interactions were featured by Science Daily, Newswise, Nanowerk, and other news media.

'25 Our work on anticoncentration in Gaussian boson sampling was selected as an Editors' Suggestion [194,202].

'25 Our work on covariant quantum error-correcting codes with metrological entanglement advantage was featured by Phys.org [208].

'23 Our work [179] on complexity phase transitions generated by entanglement was briefly discussed in the Quanta magazine.

'21 Our work on quench dynamics of a fermi gas with strong long-range interactions was featured in a Physics Viewpoint [140].

'21 Our work on domain-wall confinement was featured in Nature Physics News & Views [120].

'20 Our work on the hierarchy of linear light cones with long-range interactions was featured in a Physics Viewpoint and by opli.net [121].

'19 Our work on a fluctuation-induced torque on a topological insulator out of thermal equilibrium was selected as an Editors' Suggestion and featured in a Physics Synopsis and by Phys.org and the Science Bulletin [103].

'18 Our work on photon subtraction by many-body decoherence was selected as an Editors' Suggestion and featured by Science Daily [90].

'18 Our work on realizing a dark state optical lattice with sub-wavelength spatial structure was featured in a Physics Viewpoint and selected as an Editors' Suggestion [91].

'13 Our work on realizing fractional Chern insulators with dipolar spins was featured in a Physics Viewpoint and selected as an Editors' Suggestion [37].

'11 Our work on simulating a generalized t-J model with ultracold polar molecules was featured in a Physics Synopsis [25,26].

Patents and Patent Applications

24. N. Constantinides, A. Fahimniya, D. Devulapalli, D. Bluvstein, M. J. Gullans, J. V. Porto, A. M. Childs, A. V. Gorshkov,
Systems and Methods for Routing Protocols for Reconfigurable Atom Array,
U.S. Provisional Patent Application 63/913304, filed November 7, 2025.
Based on publication [213] below.

23. A. J. Brady, Y.-X. Wang, V. V. Albert, A. V. Gorshkov, Q. Zhuang,
Correlated Noise Estimation with Quantum Sensor Networks,
U.S. Provisional Patent Application 63/893,466, filed October 3, 2025.
Based on publication [218] below.

22. A. Schuckert, E. Crane, A. V. Gorshkov, M. Hafezi, M. J. Gullans,
Fault-tolerant quantum computing architecture using fermionic neutral atoms,
U.S. Provisional Patent Application 63/888,728, filed September 26, 2025.
Based on publication [215] below.

21. J. Yu, S. R. Muleady, Y.-X. Wang, N. Schine, A. V. Gorshkov, A. M. Childs,
Efficient preparation of Dicke states,
U.S. Provisional Patent Application 63/820861, filed June 10, 2025.
Based on publication [212] below.

20. J. Bringewatt, A. Ehrenberg, T. Goel, A. V. Gorshkov,
Function estimation protocols with photonic sensors,
U.S. Provisional Patent Application 63/751080, filed January 29, 2025.
Based on publication [197] below.

19. A. Fahimniya, H. Dehghani, K. Bharti, S. Mathew, A. J. Kollár, A. V. Gorshkov, M. J. Gullans,
Systems, Methods, and Devices for Fault-tolerant Hyperbolic Floquet Quantum Error Correcting Codes,
U.S. Patent Application 19074103, filed March 7, 2025.
Based on publication [188] below.

18. A. V. Gorshkov, Y.-A. Chen, Y. Xu,
Error-correcting Codes for Fermionic Quantum Simulation,
U.S. Patent Application 18913257, filed October 11, 2024.
Based on publication [176] below.

17. A. V. Gorshkov, M. J. Gullans, J. V. Porto, C. Fechisin, K. Sharma, P. Bienias, S. L. Rolston,
Systems, Devices, and Methods for a Non-Demolition Photon Counter using a 2D Rydberg Atom Array,
U.S. Patent Application 18806265, filed August 15, 2024.
Based on publication [177] below.
University of Maryland's Invention of the Year Award for 2023 in the Quantum category.

16. S. Lieu, Y.-J. Liu, A. V. Gorshkov,
Passive quantum memory,
U.S. Patent Application 18663156, filed May 14, 2024, allowed.
Based on publication [168] below.

15. A. Guo, J. T. Young, R. Belyansky, P. Bienias, A. V. Gorshkov,
Experimental Roadmap for Optimal State Transfer and Entanglement Generation in Power-Law Systems,
U.S. Provisional Patent Application 63/378210, filed Oct 3, 2022.
Based on publication [198] below.

14. K. C. Cox, P. Bienias, D. H. Meyer, D. P. Fahey, P. D. Kunz, A. V. Gorshkov,
Spin wave quantum computer,
U.S. Patent Application 18370411, filed Sep 20, 2023.
Based on publications [160,161] below.

13. A. Ehrenberg, J. Bringewatt, A. V. Gorshkov,
Minimum Entanglement Protocols for Function Estimation,
U.S. Patent Application 18232890, filed Aug 11, 2023.
Based on publication [162] below.
Nominated as a finalist for University of Maryland's Invention of the Year awards for 2022.

12. J. Bringewatt, I. Boettcher, P. Niroula, P. Bienias, A. V. Gorshkov,
Measurement of Multiple Functions with Quantum Sensor Networks,
U.S. Patent Application 18136257, filed Apr 18, 2023.
Based on publication [151] below.

11. A. Bapat, A. M. Childs, A. V. Gorshkov, S. King, E. Schoute, H. Shastri,
Quantum routing with fast reversals,
U.S. Patent Application 18178491, filed Mar 3, 2023.
U.S. Patent Application 18669111, filed May 20, 2023.
Based on publication [147] below.

10. J. Bringewatt, P. Bienias, T. Qian, I. Boettcher, A. V. Gorshkov,
System and Method for Measurement of Field Properties Using Quantum Sensor Networks,
U.S. Patent Application 17978420, filed Nov 1, 2022, allowed April 24, 2025.
Based on publication [142] below.

9. M. C. Tran, A. Deshpande, A. Y. Guo, A. Lucas, A. V. Gorshkov,
Systems and Methods for Optimal State Transfer and Entanglement Generation in Power-Law Interacting Systems,
U.S. Patent Application 17959901, filed Oct 4, 2022.
Based on publication [139] below.

8. L. T. Brady, L. Kocia, P. Bienias, A. Bapat, Y. Kharkov, A. V. Gorshkov,
Performing Bang-Anneal-Bang Quantum Optimization,
International Patent Application PCT/US22/29038, filed May 12, 2022.
U.S. Patent Application 18560591, filed Nov 13, 2023.
Based on publication [156] below.

7. A. Bapat, E. Schoute, A. V. Gorshkov, A. M. Childs,
Performing State Reversal on a Quantum Spin Chain,
U.S. Patent Application 17669946, filed Feb 11, 2022, allowed.
Based on publication [123] below.

6. A. Lucas, M. C. Tran, A. Ehrenberg, A. Y. Guo, A. Deshpande, A. V. Gorshkov, Z.-X. Gong, C.-F. Chen, Y. Hong,
Quantum State Transfer,
U.S. Patent 12,333,381, filed Jan 12, 2022, issued June 17, 2025.
Based on publication [121] below.

5. J. T. Young, P. Bienias, R. Belyansky, A. M. Kaufman, A. V. Gorshkov,
Qubit gate and producing a generalized controlled-not gate,
U.S. Patent 12,026,586, filed Nov 19, 2021, issued July 2, 2024.
Based on publication [129] below.

4. K. Qian, Z. Eldredge, W. Ge, G. Pagano, C. Monroe, J. V. Porto, A. V. Gorshkov,
Heisenberg Scaler,
U.S. Patent 11,562,049, filed Nov 8, 2019, issued Jan 24, 2023.
Based on publication [104] below.
Selected as a NIST technology to be featured at BIO 2024.

3. A. V. Gorshkov, M. Foss-Feig, Z. Eldredge, S. L. Rolston,
Determining a Modal Amplitude of an Inhomogeneous Field with a Quantum Sensor,
U.S. Patent 10,007,885, filed Jul 14, 2017, issued Jun 26, 2018.
Based on publication [73] below.

2. A. V. Gorshkov, M. Foss-Feig, Z. Eldredge, Z.-X. Gong, A. Hamed Moosavian, J. T. Young,
Fast Entangled State Generation and Quantum Information Transfer in Quantum Systems with Long-Range Interactions,
U.S. Patent 10,432,320, filed Nov 2, 2017, issued Oct 1, 2019;
World Intellectual Property Organization Patent WO/2018/106506, publication date Jun 14, 2018.
Based on publication [76] below.

1. N. Y. Yao, L. Jiang, A. V. Gorshkov, P. C. Maurer, G. Giedke, J. I. Cirac, M. D. Lukin,
Scalable Room Temperature Quantum Information Processor,
U.S. Patent 9,317,473, filed Dec 14, 2011, issued Apr 19, 2016;
World Intellectual Property Organization Patent WO/2012/082938, publication date Jun 21, 2012.
Based on publication [29] below.

Students and Postdocs

Sep '13–Dec '16	Mohammad Maghrebi, postdoc; currently Associate Professor at Michigan State University
Jun '13–Dec '17	Zhexuan Gong, postdoc and research scientist; currently Associate Professor at the Colorado School of Mines
Sep '16–Sep '17	Sergey Syzranov, postdoc, co-advised; currently Associate Professor at the University of California, Santa Cruz
Aug '16–Apr '19	Paraj Titum Bhattacharjee, postdoc and NRC postdoc; currently Quantum Information Scientist at The Johns Hopkins University Applied Physics Laboratory
Sep '16–Jan '21	Rex Lundgren, NRC postdoc, postdoc, and research scientist; currently Engineering and Physics Sciences Researcher at the NSA Laboratory for Physical Sciences
Oct '18–Jan '21	Igor Boettcher, postdoc; currently Associate Professor at the University of Alberta, Canada
Sep '19–Jun '21	Oles Shtanko, Theoretical Quantum Optics Postdoctoral Fellow, co-advised; currently Research Scientist at IBM Quantum
Aug '16–Oct '21	James Garrison, NRC postdoc, postdoc, and research scientist; currently quantum developer at IBM
Oct '16–Nov '21	Przemyslaw Bienias, postdoc and research scientist; currently Quantum Research Scientist at AWS
Sep '18–Feb '22	Lucas Brady, NRC postdoc, co-advised; currently Sr. Research Scientist at the NASA QuAIL group
July '21–Jan '22	Kunal Sharma, Hartree Postdoctoral Fellow, co-advised; currently Senior Research Scientist and Team Manager at IBM Quantum
July '19–Apr '22	Yaroslav Kharkov, postdoc and research scientist; currently Senior Applied Scientist at AWS
Aug' 19–Jun '22	Zhicheng Yang, postdoc, co-advised; currently Assistant Professor at Peking University
Sep '19–Oct '22	Simon Lieu, NRC postdoc; currently Research Scientist at AWS Center for Quantum Computing
Apr '21–Oct '24	Dominik Hangleiter, Hartree Postdoctoral Fellow, co-advised; currently Ambizione fellow at ETH Zuerich and a Quantum Postdoctoral fellow at the Simons Institute for the Theory of Computing at UC Berkeley
Nov '21–Sep '22	Kishor Bharti, postdoc; currently Scientist at the Institute of High Performance Computing (IHPC) in Singapore

Sep '19–Nov '22	Luis Pedro García-Pintos, postdoc, co-advised; currently Staff Scientist at Los Alamos National Laboratory
Sep '18–Mar' 23	Seth Whitsitt, NRC postdoc and research scientist; currently Sr. Principal Transformational Quantum Physicist at Northrop Grumman
Dec '18–Jul '23	Chris Baldwin, NRC postdoc and research scientist, co-advised; currently Assistant Professor at Michigan State University
May '22–Sep '23	Eleanor "Ella" Crane, postdoc, co-advised; currently Assistant Professor at King's College London
Aug '21–Feb '24	Brayden Ware, NRC postdoc and research scientist; currently Senior Research Scientist at the Google Quantum AI laboratory
Jan '22 –Jan '24	Alex Cojocaru, postdoc, co-advised; currently Assistant Professor (Chancellor Fellow) at the University of Edinburgh
Sep '22–Aug '25	Cheng-Ju "Jacob" Lin, RQS Postdoctoral Fellow, co-advised; currently Assistant Professor at the University of Miami
May '22–Jul '25	Alexander Schuckert, Theoretical Quantum Optics Postdoctoral Fellow, co-advised; currently Senior Quantum Scientist at QuEra Computing
Aug '21–	Ali Fahimniya, postdoc
Sep '23–	Sean Muleady, RQS Postdoctoral Fellow, co-advised
Sep '23–	Yuxin Wang, Hartree Postdoctoral Fellow, co-advised
Sep '23–	Emil Khabiboulline, NRC postdoc and postdoc
Jul '23–	Anthony Brady, NRC postdoc, co-advised
Aug '24–	Yifan Hong, Theoretical Quantum Optics Postdoctoral Fellow, co-advised
Sept '24–	Zhi-Yuan Wei, postdoc
Jul '24–	Lorcan Conlon, Theoretical Quantum Optics Postdoctoral Fellow, co-advised
Sep '14–May '19	Zachary Eldredge, Ph.D. student; currently Program Manager for Quantum Information Science (QIS) at the U.S. Department of Energy's Office of High Energy Physics
Jun '14–May '20	Jeremy Young, Ph.D. student; became an NRC postdoctoral fellow at JILA; currently Veni Postdoctoral Fellow at the University of Amsterdam
Sep '15–Jul '21	Fangli Liu, Ph.D. student; became a Research Scientist at QuEra; currently Quantitive Researcher at Radix Trading LLC
Sep '15–Aug '21	Abhinav Deshpande, Ph.D. student; became an IQIM Postdoctoral Scholar at Caltech; currently research scientist at IBM Quantum
Sep '16–Aug '21	Minh Tran, Ph.D. student, co-advised; became a postdoc at the MIT Center for Theoretical Physics; currently research scientist at IBM Quantum
Jun '14–Aug '21	Yidan Wang, Ph.D. student; currently postdoc at Harvard University
Sep '16–Aug '21	Aniruddha Bapat, Ph.D. student, co-advised; became a postdoc at the Lawrence Berkeley National Laboratory
Sep '16–Mar '23	Andrew Guo, Ph.D. student, co-advised; became a postdoc at Sandia National Laboratory; currently Advanced Physicist at Quantinuum
Jan '18–Jul '23	Ron Belyansky, Ph.D. student; became a Chicago Prize Postdoctoral Fellow in Theoretical Quantum Science; currently Quantum Research Scientist at AWS

Sep '19–Jul '23	Pradeep Niroula, Ph.D. student, co-advised; currently Applied Research Associate with the J.P. Morgan quantum team
Sep '16–Aug '24	Su-Kuan Chu, Ph.D. student; currently postdoc in the Center for the Theory of Quantum Matter (CTQM) at the University of Colorado (CU) Boulder
Sep '18–Aug '24	Adam Ehrenberg, Ph.D. student; currently Research Staff Member at the Institute for Defense Analyses (IDA)
Sep '18–Aug '24	Jacob Bringewatt, Ph.D. student; became a Harvard Quantum Initiative Postdoctoral Fellow; currently Assistant Professor at the US Naval Academy
Sep '20–Aug '25	Joseph Iosue, Ph.D. student, co-advised; currently Staff Scientist at The Johns Hopkins University Applied Physics Laboratory
Sep '19–Nov '25	Dhruv Devulapalli, Ph.D. student, co-advised; currently Senior Research Scientist at IonQ
Jun '21–	Sharoon Austin, Ph.D. student
Jun '21–	Jeet Girish Shah, Ph.D. student, co-advised
Jun '21–	Christopher Fechisin, Ph.D. student, co-advised
Aug '21–	Elizabeth Bennewitz, Ph.D. student
Aug '21–	Daniel Spencer, Ph.D. student
Aug '22–	Timothy "Connor" Mooney, Ph.D. student, co-advised
Aug '22–	Jeffery Yu, Ph.D. student, co-advised
Aug '23–	Thomas Steckmann, Ph.D. student, co-advised
Aug '23–	Alexandra Behne, Ph.D. student
Aug '24–	Erfan Abbasgholinejad, Ph.D. student
Aug '24–	Twesh Upadhyaya, Ph.D. student, co-advised
Aug' 24–	Chang "Nick" Li, Ph.D. student, co-advised
Mar' 25–	Vikram Kashyap, Ph.D. student, co-advised
Jul' 25–	Yunfei Wang, Ph.D. student
Sep–Oct '18	Valentin Walther, Aarhus University graduate student spent time at the University of Maryland
Aug '23–	Dong Yuan, Tsinghua University graduate student spent time (virtually) at the University of Maryland
Sep–Dec '24	Patrick Adelhardt, Friedrich-Alexander University Erlangen-Nürnberg graduate student spent time at the University of Maryland
Jun–Oct '11	Kevin Kuns, undergraduate summer student (California Institute of Technology); became a graduate student at UCSB; currently postdoc at MIT
May–Aug '16	Pradeep Niroula, Harvard undergraduate spent summer at the University of Maryland; became a graduate student at the University of Maryland; currently Applied Research Associate with the J.P. Morgan quantum team
Jun–Aug '17	Joseph Iosue, MIT undergraduate spent summer at the University of Maryland; became a graduate student at the University of Maryland; currently Staff Scientist at The Johns Hopkins University Applied Physics Laboratory

Jun–Sep '18	Nishad Maskara, Caltech undergraduate spent summer at the University of Maryland; became a graduate student at Harvard; currently postdoc at MIT
Jun–Sep '18	Kevin Wang, Stanford undergraduate spent summer at the University of Maryland; became an MSc candidate at the University of Oxford; currently graduate student at UC Berkeley
Jul–Sep '19	Marcin Kalinowski, University of Warsaw undergraduate student spent summer at the University of Maryland; currently graduate student at Harvard
Jun–Aug '20	Hrishee Shastri, Reed College undergraduate spent time at the University of Maryland, co-advised
Jun–Aug '20	Samuel King, University of Rochester undergraduate spent time at the University of Maryland, co-advised
Jun–Aug '21	Nicole Dong, UC Boulder undergraduate spent time (virtually) at the University of Maryland, co-advised
Jun–Aug '21	Sam DeCoster, Georgia Tech undergraduate spent time (virtually) at the University of Maryland, co-advised
Jun–Aug '21	Mason Wittman, Kansas State University undergraduate spent time (virtually) at the University of Maryland, co-advised
Jun–Aug '22	Akshita Gorti, Cornell undergraduate spent time at the University of Maryland
Jun '22–Aug '22	Ruozhen Gong, Mount Holyoke College undergraduate spent time at the University of Maryland
Jun '22–Aug '22	Wentai Deng, Peking University undergraduate spent time (virtually) at the University of Maryland
Apr '21–Aug '23	Weiyuan Gong, Tsinghua University undergraduate spent time (virtually) at the University of Maryland; currently graduate student at Harvard
Jun '23–Jul '25	Tianhao Liu, Peking University undergraduate spent time (virtually) at the University of Maryland; currently graduate student at CU Boulder
Jun '24–	Nathan Constantinides, University of Maryland undergraduate
Jan '18–Jan '19	Kevin Qian, Montgomery Blair high school student spent time at the University of Maryland; became an undergraduate at MIT; currently MEng Candidate at MIT
Jun–Aug '20	Timothy Qian, Montgomery Blair high school student spent time at the University of Maryland; became an undergraduate at MIT; currently Quantitative Researcher at Citadel Securities
Jun–Aug '20	Ivy Liang, Montgomery Blair high school student spent time at the University of Maryland; became an undergraduate at Harvard; currently graduate student at Yale
Jun–Aug '21	Akshita Gorti, Freedom High School student spent time (virtually) at the University of Maryland; became an undergraduate at Cornell
Jun–Aug '22	Tarushii Goel, Thomas Jefferson High School for Science and Technology student spent time at the University of Maryland; became an undergraduate at MIT
Jun '23–Oct '25	Jason Youm, Montgomery Blair high school student spent time at the University of Maryland; became an undergraduate at MIT

Jun '25– Evan Zhang, Montgomery Blair high school student spent time at the University of Maryland

Professional and Outreach Activities

'05– Referee for the following journals: Nature, Nature Physics, Nature Photonics, Nature Communications, Physical Review Letters, Physical Review X, Nature Reviews Physics, Science Advances, Physical Review B, Reports on Progress in Physics, Physical Review A, New Journal of Physics, Optics Communications, Optics Letters, Applied Physics B, and EPL (Europhysics Letters).

'15– Reviewer and review panel member for NSF (QIS, TAMOP, CMP, CMMT).

'17– Reviewer for AFOSR, ARO, DOE (NP, HEP).

'18– External referee for promotions to tenure and other faculty appointments.

'16 Review panel member for reviewing the work of ARL employees.

'20– Fellow of The American Physical Society (APS).

'18–'21 Member of the APS DAMOP (Division of Atomic, Molecular, and Optical Physics) program committee.

'08– Member of The American Physical Society (APS).

'20– Member of OPTICA (formerly Optical Society of America).

'21– Amazon Scholar at Amazon Web Services.

'18–'21 Scientific Advisory Board member at Atom Computing.

'26 Co-organizer of CIQC (Challenge Institute for Quantum Computation) 2026 Winter School on Quantum Simulation.

'23 Together with Nicolo Defenu, Giovanna Morigi, and Lea Santos, organizing a KITP program "Out-of-equilibrium dynamics and quantum information of many-body systems with long-range interactions" and the associated conference.

'23 Together with Niklas Mueller, Nicole Yunger Halpern, and Raju Venugopalan, organizing an IQuS workshop "Bridging the gap: Thermalization, from Cold Atoms to Hot Quantum Chromodynamics".

'16 Led the organization (with the help of Jason Alicea, Dima Abanin, Frank Verstraete, and Leo Radzihovsky) of a 13-week KITP program on Synthetic Quantum Matter

'16 Together with Dima Abanin, Ehud Altman, and Victor Galitski, organized a KITP conference "Designer Quantum Systems out of Equilibrium"

'19 Together with Kang-Kuen Ni, Tanya Zelevinsky, and Immanuel Bloch, organized an ITAMP workshop on cold molecules

'19 Chair of the Noisy Intermediate-Scale Quantum (NISQ) Technologies workshop at the University of Maryland

'19 Talk at Howard University

'23 Talk at the University of the District of Columbia

'15–'20 Volunteer judge for the Buck Lodge Middle School Virtual Science Fair (annually).

'25 Outreach to the public about quantum: STEM night presentation at Wayside Elementary School in Potomac, MD focused on playing with liquid nitrogen.

'23 Outreach to the public about quantum: three Career Day presentations at Wayside Elementary School in Potomac, MD focused on playing with liquid nitrogen and talking about what physicists do.

'18 Outreach to the public about quantum: the Science News for Students piece "Harry Potter can apparate. Can you?" is based, in part, on an hour-long interview with me.

'20 Outreach to the public about quantum: as part of Kids-Ask-NIST, shot a one-minute video response to the question "Could it be possible to power cities with quantum energy?".

'21– Volunteered to teach exciting beyond-school-program math to a small group of elementary school students. About 7 times in '21-'22, about 10 times in '23, and weekly since October 2024

'15– Volunteer at Maryland Day on the University of Maryland campus, nearly annually.

'16, '18 Volunteer at the USA Science and Engineering Festival.

'14– Launched and oversee the operation of a weekly quantum seminar at the University of Maryland, during which local students and postdocs from all various quantum centers at the University of Maryland give talks about their research.

'16 Gave a presentation to and chatted with the University of Maryland Society of Physics Students.

'11– Advised or co-advised 17 undergraduates and 7 high school students on summer research projects.

'13– Regularly serve on JQI and QuICS committees, such as visitor program committee, seminar committee, postdoc fellowship committee, and graduate fellowship committee.

Papers Published in or Submitted to Peer-Reviewed Journals

240. J. T. Young, K.-K. Ni, A. V. Gorshkov,
Simultaneous nondestructive measurement of many polar molecules using Rydberg atoms,
arXiv:2601.08921 [quant-ph].

239. O. Katz, A. Schuckert, T. Wang, E. Crane, A. V. Gorshkov, M. Cetina,
Hybrid digital-analog protocols for simulating quantum multi-body interactions,
arXiv:2512.21385 [quant-ph].

238. Z.-Y. Wei, J. Nelson, J. Rajakumar, E. Cruz, A. V. Gorshkov, M. J. Gullans, D. Malz,
Measurement-induced entanglement in noisy 2D random Clifford circuits,
arXiv:2510.12743 [quant-ph].

237. A. J. Brady, Z. Gong, A. V. Gorshkov, S. Guha,
Incoherent Imaging with Spatially Structured Quantum Probes,
arXiv:2510.09521 [quant-ph].

236. Z. Liu, W. DeRocco, S. Gu, E. T. Khabiboulline, S. Choi, A. M. Childs, A. Hook, A. V. Gorshkov, D. Gottesman,
Measuring gravitational lensing time delays with quantum information processing,
arXiv:2510.07898 [quant-ph].

235. E. Abbasgholinejad, S. R. Muleady, J. Bringewatt, A. J. Brady, Y.-X. Wang, A. Fahimniya, A. V. Gorshkov,
Optimally learning functions in interacting quantum sensor networks,
arXiv:2510.06360 [quant-ph].

234. N. Constantinides, J. Yu, D. Devulapalli, A. Fahimniya, A. M. Childs, M. J. Gullans, A. Schuckert, A. V. Gorshkov,
Low-depth fermion routing without ancillas,
arXiv:2510.05099 [quant-ph].

233. J. T. Iosue, Y.-X. Wang, I. Datta, S. Ghosh, C. Oh, B. Fefferman, A. V. Gorshkov,
Higher moment theory and learnability of bosonic states,
arXiv:2510.01610 [quant-ph].

232. S. Austin, D. Devulapalli, K. Hoang, F. Zhou, K. Srinivasan, A. V. Gorshkov,
A vapor-cavity-QED system for quantum computation and communication,
arXiv:2509.19432 [quant-ph].

231. Y. Wang, X. Na, M. J. Gullans, S. Yelin, A. V. Gorshkov,
Landscape of scattering universality with general dispersion relations,
arXiv:2509.01782 [physics.atom-ph].

230. J. T. Young, R. Belyansky, K.-K. Ni, A. V. Gorshkov,
Data-insensitive cooling of polar molecules with Rydberg atoms,
arXiv:2507.10671 [quant-ph].

229. T. Steckmann, D. Luo, Y.-X. Wang, S. R. Muleady, A. Seif, C. Monroe, M. J. Gullans, A. V. Gorshkov, O. Katz, A. Schuckert,
Error mitigation of shot-to-shot fluctuations in analog quantum simulators,
arXiv:2506.16509 [quant-ph].

228. R. Kaubruegger, D. Fallas Padilla, A. Shankar, C. Hotter, S. R. Muleady, J. Bringewatt, Y. Baamara, E. Abbasgholinejad, A. V. Gorshkov, K. Mølmer, J. K. Thompson, A. M. Rey,
Lieb-Mattis states for robust entangled differential phase sensing,
arXiv:2506.10151 [quant-ph].

227. A. V. Gorshkov, D. Cohen, A. Haim, A. Rotem, O. Golan, G. Kim, A. Butler, C. T. Hann, O. Painter, F. G. S. L. Brandão, A. Retzker,
Cavity-mediated cross-cross-resonance gate,
arXiv:2506.03239 [quant-ph].

226. T. C. Mooney, D. Yuan, A. Ehrenberg, C. L. Baldwin, A. V. Gorshkov, A. M. Childs,
Time independence does not limit information flow. II. The case with ancillas,
arXiv:2505.18254 [quant-ph].

225. D. Yuan, C. Yin, T. C. Mooney, C. L. Baldwin, A. M. Childs, A. V. Gorshkov,
Time Independence Does Not Limit Information Flow. I. The Free-Particle Case,
arXiv:2505.18249 [quant-ph].

224. D. Devulapalli, C. Yin, A. Y. Guo, E. Schoute, A. M. Childs, A. V. Gorshkov, A. Lucas,
Quantum Routing and Entanglement Dynamics Through Bottlenecks,
PRX Quantum (in press); arXiv:2505.16948 [quant-ph].

223. D. Luo, F. M. Surace, A. De, A. Lerose, E. R. Bennewitz, B. Ware, A. Schuckert, Z. Davoudi, A. V. Gorshkov, O. Katz, C. Monroe,
Quantum simulation of bubble nucleation across a quantum phase transition,
arXiv:2505.09607 [quant-ph].

222. S. Austin, M. E. S. Morales, A. V. Gorshkov,
Efficiently learning fermionic unitaries with few non-Gaussian gates,
arXiv:2504.15356 [quant-ph].

221. J. Shah, G. Nambiar, A. V. Gorshkov, V. Galitski,
A quantum monomer-dimer model on Penrose tilings,
arXiv:2503.15588 [cond-mat.str-el].

220. L. P. García-Pintos, Y.-K. Liu, A. V. Gorshkov,
Reshaping the Quantum Arrow of Time,
Phys. Rev. X (in press); arXiv:2503.13615 [quant-ph].

219. G. González-García, A. V. Gorshkov, J. I. Cirac, R. Trivedi,
Dynamical complexity of non-Gaussian many-body systems with dissipation,
Phys. Rev. Lett. 135, 190401 (2025); arXiv:2502.05658 [quant-ph].

218. A. J. Brady, Y.-X. Wang, V. V. Albert, A. V. Gorshkov, Q. Zhuang,
Correlated Noise Estimation with Quantum Sensor Networks,
arXiv:2412.17903 [quant-ph].
U.S. Provisional Patent Application 63/893,466.

217. J. T. Young, A. V. Gorshkov, M. Maghrebi,
Nonequilibrium universality of the nonreciprocally coupled $\boldsymbol{O(n_1)} \times \boldsymbol{O(n_2)}$ model,
Phys. Rev. E (in press); arXiv:2411.12680 [cond-mat.stat-mech].

216. F. M. Surace, A. Lerose, O. Katz, E. R. Bennewitz, A. Schuckert, D. Luo, A. De, B. Ware, W. Morong, K. Collins, C. Monroe, Z. Davoudi, A. V. Gorshkov,
String-Breaking Dynamics in Quantum Adiabatic and Diabatic Processes,
arXiv:2411.10652 [quant-ph].

215. A. Schuckert, E. Crane, A. V. Gorshkov, M. Hafezi, M. J. Gullans,
Fermion-qubit fault-tolerant quantum computing,
arXiv:2411.08955 [quant-ph].
U.S. Provisional Patent Application 63/888,728.

214. D. Kurdak, P. R. Banner, Y. Li, S. R. Muleady, A. V. Gorshkov, S. L. Rolston, J. V. Porto,
Enhancement of Rydberg Blockade via Microwave Dressing,
Phys. Rev. Lett. 134, 123404 (2025); arXiv:2411.08236 [physics.atom-ph].

213. N. Constantinides, A. Fahimniya, D. Devulapalli, D. Bluvstein, M. J. Gullans, J. V. Porto, A. M. Childs, A. V. Gorshkov,
Optimal Routing Protocols for Reconfigurable Atom Arrays,
arXiv:2411.05061 [quant-ph].
U.S. Provisional Patent Application 63/913304.

212. J. Yu, S. R. Muleady, Y.-X. Wang, N. Schine, A. V. Gorshkov, A. M. Childs,
Efficient preparation of Dicke states,
Phys. Rev. Lett. 136, 030601 (2026); arXiv:2411.03428 [quant-ph].
U.S. Provisional Patent Application 63/820861.

211. A. De, A. Lerose, D. Luo, F. M. Surace, A. Schuckert, E. R. Bennewitz, B. Ware, W. Morong, K. S. Collins, Z. Davoudi, A. V. Gorshkov, O. Katz, C. Monroe,
Observation of string-breaking dynamics in a quantum simulator,
arXiv:2410.13815 [quant-ph].

210. J. Shah, C. Fechisin, Y.-X. Wang, J. T. Iosue, J. D. Watson, Y.-Q. Wang, B. Ware, A. V. Gorshkov, C.J. Lin,
Instability of steady-state mixed-state symmetry-protected topological order to strong-to-weak spontaneous symmetry breaking,
Quantum 9, 1912 (2025); arXiv:2410.12900 [quant-ph].

209. Y.-X. Wang, J. Bringewatt, A. Seif, A. J. Brady, C. Oh, A. V. Gorshkov,
Exponential entanglement advantage in sensing correlated noise,
arXiv:2410.05878 [quant-ph].

208. C.-J. Lin, Z.-W. Liu, V. V. Albert, A. V. Gorshkov,
Covariant Quantum Error-Correcting Codes with Metrological Entanglement Advantage,
Phys. Rev. Lett. 135, 110801 (2025); arXiv:2409.20561 [quant-ph].

207. H. Putterman *et al.*,
Hardware-efficient quantum error correction using concatenated bosonic qubits,
Nature 638, 927 (2025); arXiv:2409.13025 [quant-ph].

206. J. Bringewatt, Z. Steffen, M. A. Ritter, A. Ehrenberg, H. Wang, B. S. Palmer, A. J. Kollár, A. V. Gorshkov, L. P. García-Pintos,
Generalized geometric speed limits for quantum observables,
Phys. Rev. Research 7, 033222 (2025); arXiv:2409.04544 [quant-ph].

205. N. Berthusen, D. Devulapalli, E. Schoute, A. M. Childs, M. J. Gullans, A. V. Gorshkov, D. Gottesman,
Toward a 2D Local Implementation of Quantum LDPC Codes,
PRX Quantum 6, 010306 (2025); arXiv:2404.17676 [quant-ph].
Featured in a Physics Synopsis, chosen to be on the cover of PRX Quantum, and selected for the International Year of Quantum Collection.

204. R. Zektzer, X. Lu, K. T. Hoang, R. Shrestha, S. Austin, F. Zhou, A. Chanana, G. Holland, D. Westly, P. Lett, A. V. Gorshkov, K. Srinivasan,
Strong interactions between integrated microresonators and alkali atomic vapors: towards single-atom, single-photon operation,
Optica 11, 1376 (2024); arXiv:2404.04372 [quant-ph].

203. J. Youm, J. T. Iosue, A. Ehrenberg, Y.-X. Wang, A. V. Gorshkov,
Average Rényi Entanglement Entropy in Gaussian Boson Sampling,
Phys. Rev. Research 7, 023125 (2025); arXiv:2403.18890 [quant-ph].

202. A. Ehrenberg, J. T. Iosue, A. Deshpande, D. Hangleiter, A. V. Gorshkov,
The Second Moment of Hafnians in Gaussian Boson Sampling,
Phys. Rev. A 111, 042412 (2025); arXiv:2403.13878 [quant-ph].
Selected as an Editors' Suggestion.

201. H. Levine *et al.*,
Demonstrating a long-coherence dual-rail erasure qubit using tunable transmons,
Phys. Rev. X 14, 011051 (2024); arXiv:2307.08737 [quant-ph].

200. Z. Liu, D. Devulapalli, D. Hangleiter, Y.-K. Liu, A. J. Kollár, A. V. Gorshkov, A. M. Childs,
Efficiently verifiable quantum advantage on near-term analog quantum simulators,
PRX Quantum 6, 010341 (2025); arXiv:2403.08195 [quant-ph].

199. E. R. Bennewitz, B. Ware, A. Schuckert, A. Lerose, F. M. Surace, R. Belyansky, W. Morong, D. Luo, A. De, K. S. Collins, O. Katz, C. Monroe, Z. Davoudi, A. V. Gorshkov,
Simulating Meson Scattering on Spin Quantum Simulators,
Quantum 9, 1773 (2025); arXiv:2403.07061 [quant-ph].

198. A. Y. Guo, J. T. Young, R. Belyansky, P. Bienias, A. V. Gorshkov,
Experimental roadmap for optimal state transfer and entanglement generation in power-law systems,
arXiv:2402.07974 [quant-ph].
U.S. Provisional Patent Application 63/378210.

197. J. Bringewatt, A. Ehrenberg, T. Goel, A. V. Gorshkov,
Optimal function estimation with photonic quantum sensor networks,
Phys. Rev. Research 6, 013246 (2024); arXiv:2401.16472 [quant-ph].
U.S. Provisional Patent Application 63/751080.

196. L. P. García-Pintos, K. Bharti, J. Bringewatt, H. Dehghani, A. Ehrenberg, N. Yunger Halpern, A. V. Gorshkov,
Estimation of Hamiltonian parameters from thermal states,
Phys. Rev. Lett. 133, 040802 (2024); arXiv:2401.10343 [quant-ph]. Talk at Quantum Thermodynamics 2025.

195. L. Xiang, W. Jiang, Z. Bao, Z. Song, S. Xu, K. Wang, J. Chen, F. Jin, X. Zhu, Z. Zhu, F. Shen, N. Wang, C. Zhang, Y. Wu, Y. Zou, J. Zhong, Z. Cui, A. Zhang, Z. Tan, T. Li, Y. Gao, J. Deng, X. Zhang, H. Dong, P. Zhang, S. Jiang, W. Li, Z. Lu, Z.-Z. Sun, H. Li, Z. Wang, C. Song, Q. Guo, F. Liu, Z.-X. Gong, A. V. Gorshkov, N. Y. Yao, T. Iadecola, F. Machado, H. Wang, D.-L. Deng,
Long-lived topological time-crystalline order on a quantum processor,
Nat. Commun. 15, 8963 (2024); arXiv:2401.04333 [quant-ph].

194. A. Ehrenberg, J. T. Iosue, A. Deshpande, D. Hangleiter, A. V. Gorshkov,
Transition of Anticoncentration in Gaussian Boson Sampling,
Phys. Rev. Lett. 134, 140601 (2025); arXiv:2312.08433 [quant-ph].

193. J. D. Watson, J. Bringewatt, A. F. Shaw, A. M. Childs, A. V. Gorshkov, Z. Davoudi, *Quantum Algorithms for Simulating Nuclear Effective Field Theories*, arXiv:2312.05344 [quant-ph].

192. J. T. Iosue, T. C. Mooney, A. Ehrenberg, A. V. Gorshkov, *Projective toric designs, difference sets, and quantum state designs*, Quantum 8, 1546 (2024); arXiv:2311.13479 [quant-ph]. QIP 2025 talk.

191. A. Schuckert, O. Katz, L. Feng, E. Crane, A. De, M. Hafezi, A. V. Gorshkov, C. Monroe, *Observation of a finite-energy phase transition in a one-dimensional quantum simulator*, Nature Phys. 21, 374 (2025); arXiv:2310.19869 [quant-ph].

190. P. Niroula, J. Dolde, X. Zheng, J. Bringewatt, A. Ehrenberg, K. C. Cox, J. Thompson, M. J. Gullans, S. Kolkowitz, and A. V. Gorshkov, *Quantum Sensing with Erasure Qubits*, Phys. Rev. Lett. 133, 080801 (2024); arXiv:2310.01512 [quant-ph].

189. A. De, P. Cook, K. Collins, W. Morong, D. Paz, P. Titum, G. Pagano, A. V. Gorshkov, M. Maghrebi, C. Monroe, *Non-equilibrium critical scaling and universality in a quantum simulator*, Nature Commun. 16, 7939 (2025); arXiv:2309.10856 [quant-ph].

188. A. Fahimniya, H. Dehghani, K. Bharti, S. Mathew, A. J. Kollár, A. V. Gorshkov, M. J. Gullans, *Fault-tolerant hyperbolic Floquet quantum error correcting codes*, Quantum 9, 1849 (2025); arXiv:2309.10033 [quant-ph]. U.S. Patent Application 19074103.

187. O. Shtanko, Y.-J. Liu, S. Lieu, A. V. Gorshkov, V. V. Albert, *Bounds on Autonomous Quantum Error Correction*, Quantum 9, 1804 (2025); arXiv:2308.16233 [quant-ph].

186. W. Gong, Y. Kharkov, M. C. Tran, P. Bienias, A. V. Gorshkov, *Improved Digital Quantum Simulation by Non-Unitary Channels*, arXiv:2307.13028 [quant-ph].

185. R. Belyansky, S. Whitsitt, N. Mueller, A. Fahimniya, E. R. Bennewitz, Z. Davoudi, A. V. Gorshkov, *High-Energy Collision of Quarks and Mesons in the Schwinger Model: From Tensor Networks to Circuit QED*, Phys. Rev. Lett. 132, 091903 (2024); arXiv:2307.02522 [quant-ph].

184. I. Zuk, D. Cohen, A. V. Gorshkov, A. Retzker, *Robust gates with spin-locked superconducting qubits*, Phys. Rev. Research 6, 013217 (2024); arXiv:2306.09149 [quant-ph].

183. J. Kwan, P. Segura, Y. Li, S. Kim, A. V. Gorshkov, A. Eckardt, B. Bakkali-Hassani, M. Greiner, *Realization of 1D Anyons with Arbitrary Statistical Phase*, Science 386, 1055 (2024); arXiv:2306.01737 [cond-mat.quant-gas].

182. B. Ware, A. Deshpande, D. Hangleiter, P. Niroula, B. Fefferman, A. V. Gorshkov, M. J. Gullans,
A sharp phase transition in linear cross-entropy benchmarking,
arXiv:2305.04954 [quant-ph].

181. S.-K. Chu, G. Zhu, A. V. Gorshkov,
Entanglement Renormalization Circuits for Chiral Topological Order,
arXiv:2304.13748 [quant-ph].
TQC 2023 talk.

180. J. Shah, G. Nambiar, A. V. Gorshkov, V. Galitski,
Quantum spin ice in three-dimensional Rydberg atom arrays,
Phys. Rev. X 15, 011025 (2025); arXiv:2301.04657 [cond-mat.quant-gas].

179. S. Ghosh, A. Deshpande, D. Hangleiter, A. V. Gorshkov, B. Fefferman,
Complexity Phase Transitions Generated by Entanglement,
Phys. Rev. Lett. 131, 030601 (2023); arXiv:2212.10582 [quant-ph].

178. L. Feng, O. Katz, C. Haack, M. Maghrebi, A. V. Gorshkov, Z. Gong, M. Cetina, C. Monroe,
Continuous Symmetry Breaking in a Trapped-Ion Spin Chain,
Nature 623, 713 (2023); arXiv:2211.01275 [quant-ph].

177. C. Fechisin, K. Sharma, P. Bienias, S. L. Rolston, J. V. Porto, M. J. Gullans, A. V. Gorshkov,
Quantum Non-Demolition Photon Counting in a 2d Rydberg Atom Array,
arXiv:2210.10798 [quant-ph].
U.S. Patent Application 18806265.

176. Y.-A. Chen, A. V. Gorshkov, Y. Xu,
Error-correcting codes for fermionic quantum simulation,
SciPost Phys. 16, 033 (2024); arXiv:2210.08411 [quant-ph].
U.S. Patent Application 18913257.

175. A. Vrajitoarea, R. Belyansky, R. Lundgren, S. Whitsitt, A. V. Gorshkov, A. A. Houck,
Ultrastrong light-matter interaction in a photonic crystal,
arXiv:2209.14972 [quant-ph].

174. J. T. Iosue, A. Ehrenberg, D. Hangleiter, A. Deshpande, A. V. Gorshkov,
Page curves and typical entanglement in linear optics,
Quantum 7, 1017 (2023); arXiv:2209.06838 [quant-ph].

173. J. Wildeboer, C. M. Langlett, Z.-C. Yang, A. V. Gorshkov, T. Iadecola, S. Xu,
Quantum Many-Body Scars from Einstein-Podolsky-Rosen States in Bilayer Systems,
Phys. Rev. B 106, 205142 (2022); arXiv:2209.05527 [cond-mat.str-el].

172. C. L. Baldwin, A. Ehrenberg, A. Y. Guo, A. V. Gorshkov,
Disordered Lieb-Robinson bounds in one dimension,
PRX Quantum 4, 020349 (2023); arXiv:2208.05509 [cond-mat.dis-nn].

171. X. Zhang, W. Jiang, J. Deng, K. Wang, J. Chen, P. Zhang, W. Ren, H. Dong, S. Xu, Y. Gao, F. Jin, X. Zhu, Q. Guo, H. Li, C. Song, A. V. Gorshkov, T. Iadecola, F. Liu, Z.-X. Gong, Z. Wang, D.L. Deng, H. Wang,
Digital quantum simulation of Floquet symmetry-protected topological phases,
Nature 607, 468 (2022).

170. A. Bapat, A. M. Childs, A. V. Gorshkov, E. Schoute,
Advantages and limitations of quantum routing,
PRX Quantum 4, 010313 (2023); arXiv:2206.01766 [quant-ph].

169. A. Ehrenberg, A. Deshpande, C. L. Baldwin, D. A. Abanin, A. V. Gorshkov,
Simulation Complexity of Many-Body Localized Systems,
arXiv:2205.12967 [quant-ph].
QIP 2023 talk.

168. S. Lieu, Y.-J. Liu, A. V. Gorshkov,
Candidate for a passively protected quantum memory in two dimensions,
Phys. Rev. Lett. 133, 030601 (2024); arXiv:2205.09767 [quant-ph].
U.S. Patent Application 18663156.

167. D. Devulapalli, E. Schoute, A. Bapat, A. M. Childs, A. V. Gorshkov,
Quantum Routing with Teleportation,
Phys. Rev. Research 6, 033313 (2024); arXiv:2204.04185 [quant-ph].

166. M. Van Regemortel, O. Shtanko, L. P. García-Pintos, A. Deshpande, H. Dehghani, A. V. Gorshkov, M. Hafezi,
Monitoring-induced Entanglement Entropy and Sampling Complexity,
Phys. Rev. Research 4, L032021 (2022); arXiv:2201.12672 [quant-ph].

165. A. Deshpande, P. Niroula, O. Shtanko, A. V. Gorshkov, B. Fefferman, M. J. Gullans,
Tight bounds on the convergence of noisy random circuits to the uniform distribution,
PRX Quantum 3, 040329 (2022); arXiv:2112.00716 [quant-ph].
Selected as an Editors' Suggestion.
QIP 2022 talk.

164. Y. Kharkov, O. Shtanko, A. Seif, P. Bienias, M. Van Regemortel, M. Hafezi, A. V. Gorshkov,
Discovering hydrodynamic equations of many-body quantum systems,
arXiv:2111.02385 [quant-ph].

163. A. Y. Guo, S. Lieu, M. C. Tran, A. V. Gorshkov,
Clustering of steady-state correlations in open systems with long-range interactions,
arXiv:2110.15368 [quant-ph].

162. A. Ehrenberg, J. Bringewatt, A. V. Gorshkov,
Minimum Entanglement Protocols for Function Estimation,
Phys. Rev. Research 5, 033228 (2023); arXiv:2110.07613 [quant-ph].
U.S. Patent Application 18232890.

161. K. C. Cox, P. Bienias, D. H. Meyer, P. D. Kunz, D. P. Fahey, A. V. Gorshkov,
Linear and continuous variable spin-wave processing using a cavity-coupled atomic ensemble,
arXiv:2109.15246 [physics.atom-ph]

160. K. C. Cox, P. Bienias, D. H. Meyer, D. P. Fahey, P. D. Kunz, A. V. Gorshkov,
Spin-Wave Quantum Computing with Atoms in a Single-Mode Cavity,
Phys. Rev. Research 4, 033149 (2022); arXiv:2109.15252 [physics.atom-ph].
U.S. Patent Application 18370411.

159. J. T. Young, A. V. Gorshkov, I. B. Spielman,
Feedback-stabilized dynamical steady states in the Bose-Hubbard model,
Phys. Rev. Research 3, 043075 (2021); arXiv:2106.09744 [cond-mat.quant-gas].

158. L. P. García-Pintos, S. Nicholson, J. R. Green, A. del Campo, A. V. Gorshkov,
Unifying Quantum and Classical Speed Limits on Observables,
Phys. Rev. X 12, 011038 (2022); arXiv:2108.04261 [quant-ph].

157. C. M. Langlett, Z.-C. Yang, J. Wildeboer, A. V. Gorshkov, T. Iadecola, S. Xu,
Rainbow Scars: From Area to Volume Law,
Phys. Rev. B 105, L060301 (2022); arXiv:2107.03416 [cond-mat.str-el].

156. L. T. Brady, L. Kocia, P. Bienias, A. Bapat, Y. Kharkov, A. V. Gorshkov,
Behavior of Analog Quantum Algorithms,
arXiv:2107.01218 [quant-ph].
USRA Q2B Applied NISQ Computing Paper 2021 Award.
International Patent Application PCT/US22/29038.
U.S. Patent Application 18560591.

155. C. Noel, P. Niroula, A. Risinger, L. Egan, D. Biswas, M. Cetina, A. V. Gorshkov, M. Gullans, D. A. Huse, C. Monroe,
Measurement-induced quantum phases realized in a trapped-ion quantum computer,
Nature Phys. 18, 760 (2022); arXiv:2106.05881 [quant-ph].

154. P. Bienias, I. Boettcher, R. Belyansky, A. J. Kollar, A. V. Gorshkov,
Circuit Quantum Electrodynamics in Hyperbolic Space: From Photon Bound States to Frustrated Spin Models,
Phys. Rev. Lett. 128, 013601 (2022); arXiv:2105.06490 [quant-ph].

153. S. Lieu, M. McGinley, O. Shtanko, N. R. Cooper, A. V. Gorshkov,
Kramers' degeneracy for open systems in thermal equilibrium,
Phys. Rev. B 105, L121104 (2022); arXiv:2105.02888 [cond-mat.mes-hall].

152. I. Boettcher, A. V. Gorshkov, A. J. Kollár, J. Maciejko, S. Rayan, R. Thomale,
Crystallography of Hyperbolic Lattices,
Phys. Rev. B 105, 125118 (2022); arXiv:2105.01087 [cond-mat.str-el].
Selected as an Editors' Suggestion.

151. J. Bringewatt, I. Boettcher, P. Niroula, P. Bienias, A. V. Gorshkov,
Protocols for estimating multiple functions with quantum sensor networks: geometry and performance,
Phys. Rev. Research 3, 033011 (2021); arXiv:2104.09540 [quant-ph].
U.S. Patent Application 18136257.

150. M. C. Tran, A. Y. Guo, C. L. Baldwin, A. Ehrenberg, A. V. Gorshkov, A. Lucas,
The Lieb-Robinson light cone for power-law interactions,
Phys. Rev. Lett. 127, 160401 (2021); arXiv:2103.15828 [quant-ph].

149. Y. Wang, M. J. Gullans, X. Na, A. V. Gorshkov,
Universal scattering with general dispersion relations,
Phys. Rev. Research 4, 023014 (2022); arXiv:2103.09830 [quant-ph].

148. C. L. Baldwin, P. Bienias, A. V. Gorshkov, M. J. Gullans, M. Maghrebi,
Singularities in nearly-uniform 1D condensates due to quantum diffusion,
Phys. Rev. A 104, L041303 (2021); arXiv:2103.06293 [quant-ph].

147. A. Bapat, A. M. Childs, A. V. Gorshkov, S. King, E. Schoute, H. Shastri,
Quantum routing with fast reversals,
Quantum 5, 533 (2021); arXiv:2103.03264 [quant-ph].
U.S. Patent Applications 18178491 and 18669111.

146. Y. Alexeev, D. Bacon, K. R. Brown, R. Calderbank, L. D. Carr, F. T. Chong, B. DeMarco, D. Englund, E. Farhi, B. Fefferman, A. V. Gorshkov, A. Houck, J. Kim, S. Kimmel, M. Lange, S. Lloyd, M. D. Lukin, D. Maslov, P. Maunz, C. Monroe, J. Preskill, M. Roetteler, M. J. Savage, and J. Thompson,
Quantum Computer Systems for Scientific Discovery,
PRX Quantum 2, 017001 (2021); arXiv:1912.07577 [quant-ph].

145. W. Morong, F. Liu, P. Becker, K. S. Collins, L. Feng, A. Kyprianidis, G. Pagano, T. You, A. V. Gorshkov, C. Monroe,
Observation of Stark many-body localization without disorder,
Nature 599, 393 (2021); arXiv:2102.07250 [quant-ph].

144. C. Monroe, W. C. Campbell, L.-M. Duan, Z.-X. Gong, A. V. Gorshkov, P. Hess, R. Islam, K. Kim, N. Linke, G. Pagano, P. Richerme, C. Senko, N. Y. Yao,
Programmable quantum simulations of spin systems with trapped ions,
Rev. Mod. Phys. 93, 025001 (2021); arXiv:1912.07845 [quant-ph].

143. F. Liu, Z.-C. Yang, P. Bienias, T. Iadecola, A. V. Gorshkov,
Localization and criticality in antiblockaded 2D Rydberg atom arrays,
Phys. Rev. Lett. 128, 013603 (2022); arXiv:2012.03946 [cond-mat.quant-gas].

142. T. Qian, J. Bringewatt, I. Boettcher, P. Bienias, A. V. Gorshkov,
Optimal Measurement of Field Properties with Quantum Sensor Networks,
Phys. Rev. A 103, L030601 (2021); arXiv:2011.01259 [quant-ph].
U.S. Patent Application 17978420.

141. M. Kalinowski, Y. Wang, P. Bienias, M. J. Gullans, D. P. Ornelas-Huerta, A. N. Craddock, S. L. Rolston, J. V. Porto, H. P. Büchler, A. V. Gorshkov,
Resonant enhancement of three-body loss between strongly interacting photons,
Phys. Rev. Research 4, L022059 (2022); Xiv:2010.09772 [cond-mat.quant-gas].

140. E. Guardado-Sanchez, B. Spar, P. Schauss, R. Belyansky, J. T. Young, P. Bienias, A. V. Gorshkov, T. Iadecola, W. S. Bakr,
Quench Dynamics of a Fermi Gas with Strong Long-Range Interactions,
Phys. Rev. X 11, 021036 (2021); arXiv:2010.05871 [cond-mat.quant-gas].
Featured in a Physics Viewpoint: X. Li, Physics 14, 74 (2021).

139. M. C. Tran, A. Deshpande, A. Y. Guo, A. Lucas, A. V. Gorshkov,
Optimal state transfer and entanglement generation in power-law interacting systems,
Phys. Rev. X 11, 031016 (2021); arXiv:2010.02930 [quant-ph].
QIP 2021 talk.
U.S. Provisional Patent Application 63/262085.

138. D. P. Ornelas-Huerta, P. Bienias, A. N. Craddock, M. J. Gullans, A. J. Hachtel, M. Kalinowski, M. E. Lyon, A. V. Gorshkov, S. L. Rolston, J. V. Porto,
Tunable three-body loss in a nonlinear Rydberg medium,
Phys. Rev. Lett. 126, 173401 (2021); arXiv:2009.13599 [quant-ph].

137. S. Lieu, R. Belyansky, J. T. Young, R. Lundgren, V. V. Albert, A. V. Gorshkov,
Symmetry breaking and error correction in open quantum systems,
Phys. Rev. Lett. 125, 240405 (2020); arXiv:2008.02816 [quant-ph].
Featured by theregister.com, qubitreport.com, medium.com and numerous other news media.

136. A. Deshpande, A. V. Gorshkov, B. Fefferman,
Importance of the Spectral gap in Estimating Ground-State Energies,
PRX Quantum 3, 040327 (2022); arXiv:2007.11582 [quant-ph].
QIP 2021 talk.

135. O. Katz, R. Shaham, E. Reches, A. V. Gorshkov, O. Firstenberg,
Optical quantum memory for noble-gas spins based on spin-exchange collisions,
Phys. Rev. A 105, 042606 (2022); arXiv:2007.10177 [quant-ph].

134. O. Katz, E. Reches, R. Shaham, E. Poem, A. V. Gorshkov, O. Firstenberg,
Optimal Strategies for Optical Quantum Memories Using Long-Lived Noble-Gas Spins,
Phys. Rev. Research 7, 043345 (2025); arXiv:2007.08770 [quant-ph].

133. F. Liu, S. Whitsitt, P. Bienias, R. Lundgren, A. V. Gorshkov,
Realizing and Probing Baryonic Excitations in Rydberg Atom Arrays,
arXiv:2007.07258 [cond-mat.quant-gas].

132. R. Belyansky, S. Whitsitt, R. Lundgren, Y. Wang, A. Vrajitoarea, A. A. Houck, A. V. Gorshkov,
Frustration-induced anomalous transport and strong photon decay in waveguide QED,
Phys. Rev. Research 3, L032058 (2021); arXiv:2007.03690 [quant-ph].

131. A. Y. Guo, A. Deshpande, S.-K. Chu, Z. Eldredge, P. Bienias, D. Devulapalli, Y. Su, A. M. Childs, A. V. Gorshkov,
Implementing a Fast Unbounded Quantum Fanout Gate Using Power-Law Interactions,
Phys. Rev. Research 4, L042016 (2022); arXiv:2007.00662 [quant-ph].

130. J. B. Curtis, I. Boettcher, J. T. Young, M. F. Maghrebi, H. Carmichael, A. V. Gorshkov, M. Foss-Feig,
Critical Theory for the Breakdown of Photon Blockade,
Phys. Rev. Research 3, 023062 (2021); arXiv:2006.05593 [quant-ph].

129. J. T. Young, P. Bienias, R. Belyansky, A. M. Kaufman, A. V. Gorshkov,
Asymmetric blockade and multi-qubit gates via dipole-dipole interactions,
Phys. Rev. Lett. 127, 120501 (2021); arXiv:2006.02486 [quant-ph].
U.S. Patent 12,026,586.

128. O. Shtanko, A. Deshpande, P. S. Julienne, A. V. Gorshkov,
Complexity of Fermionic Dissipative Interactions and Applications to Quantum Computing,
PRX Quantum 2, 030350 (2021); arXiv:2005.10840 [quant-ph].

127. R. Belyansky, P. Bienias, Y. A. Kharkov, A. V. Gorshkov, B. Swingle,
A minimal model for fast scrambling,
Phys. Rev. Lett. 125, 130601 (2020); arXiv:2005.05362 [quant-ph].

126. O. Shtanko, Y. A. Kharkov, L. P. García-Pintos, A. V. Gorshkov,
Classical Models of Entanglement in Monitored Random Circuits,
arXiv:2004.06736 [cond-mat.dis-nn].

125. L. T. Brady, C. L. Baldwin, A. Bapat, Y. Kharkov, A. V. Gorshkov,
Optimal Protocols in Quantum Annealing and QAOA Problems,
Phys. Rev. Lett. 126, 070505 (2021); arXiv:2003.08952 [quant-ph].

124. P. Bienias, M. J. Gullans, M. Kalinowski, A. N. Craddock, D. P. Ornelas-Huerta, S. L. Rolston, J. V. Porto, A. V. Gorshkov,
Exotic photonic molecules via Lennard-Jones-like potentials,
Phys. Rev. Lett. 125, 093601 (2020); arXiv:2003.07864 [cond-mat.quant-gas].

123. A. Bapat, E. Schoute, A. V. Gorshkov, A. M. Childs,
Nearly optimal time-independent reversal of a spin chain,
Phys. Rev. Research 4, L012023 (2022); arXiv:2003.02843 [quant-ph].
U.S. Patent Application 17669946.

122. D. P. Ornelas-Huerta, A. N. Craddock, E. A. Goldschmidt, A. J. Hachtel, Y. Wang, P. Bienias, A. V. Gorshkov, S. L. Rolston, J. V. Porto,
On-demand indistinguishable single photons from an efficient and pure source based on a Rydberg ensemble,
Optica 7, 813 (2020); arXiv:2003.02202 [quant-ph].

121. M. C. Tran, C.-F. Chen, A. Ehrenberg, A. Y. Guo, A. Deshpande, Y. Hong, Z.-X. Gong, A. V. Gorshkov, A. Lucas,
Hierarchy of linear light cones with long-range interactions,
Phys. Rev. X 10, 031009 (2020); arXiv:2001.11509 [quant-ph].
Featured in a Physics Viewpoint: M. Cheneau and L. Sanchez-Palencia, Physics 13, 109 (2020).
Featured by opli.net.
U.S. Patent Application 17574301.

120. W. L. Tan, P. Becker, F. Liu, G. Pagano, K. S. Collins, A. De, L. Feng, H. B. Kaplan, A. Kyprianidis, R. Lundgren, W. Morong, S. Whitsitt, A. V. Gorshkov, C. Monroe,
Domain-wall confinement and dynamics in a quantum simulator,
Nature Phys. 17, 742 (2021); arXiv:1912.11117 [quant-ph].
Featured in Nature Physics News & Views: R. Konik, *Trapped Ions: Quantum Coherence Confined.*

119. M. C. Tran, S.-K. Chu, Y. Su, A. M. Childs, A. V. Gorshkov,
Destructive Error Interference in Product-Formula Lattice Simulation,
Phys. Rev. Lett. 124, 220502 (2020); arXiv:1912.11047 [quant-ph].

118. Z.-C. Yang, F. Liu, A. V. Gorshkov, T. Iadecola,
Hilbert-Space Fragmentation from Strict Confinement,
Phys. Rev. Lett. 124, 207602 (2020); arXiv:1912.04300 [cond-mat.str-el].

117. R. Verdel, F. Liu, S. Whitsitt, A. V. Gorshkov, M. Heyl,
Real-time dynamics of string breaking in quantum spin chains,
Phys. Rev. B 102, 014308 (2020); arXiv:1911.11382 [cond-mat.stat-mech].

116. I. Boettcher, P. Bienias, R. Belyansky, A. J. Kollár, A. V. Gorshkov,
Quantum Simulation of Hyperbolic Space with Circuit Quantum Electrodynamics: From Graphs to Geometry,
Phys. Rev. A 102, 032208 (2020); arXiv:1910.12318 [quant-ph].
Selected as an Editors' Suggestion. Featured in a Physics Synopsis.

115. R. Lundgren, A. V. Gorshkov, M. F. Maghrebi,
Nature of the non-equilibrium phase transition in the non-Markovian driven Dicke model,
Phys. Rev. A 102, 032218 (2020); arXiv:1910.04319 [quant-ph].

114. V. V. Orre, E. A. Goldschmidt, A. Deshpande, A. V. Gorshkov, V. Tamma, M. Hafezi, and S. Mittal,
Interference of Temporally Distinguishable Photons Using Frequency-Resolved Detection,
Phys. Rev. Lett. 123, 123603 (2019); arXiv:1904.03222 [physics.optics].

113. Z. Eldredge, L. Zhou, A. Bapat, J. R. Garrison, A. Deshpande, F. T. Chong, A. V. Gorshkov,
Entanglement Bounds on the Performance of Quantum Computing Architectures,
Phys. Rev. Research 2, 033316 (2020); arXiv:1908.04802 [quant-ph].

112. M. C. Tran, A. Ehrenberg, A. Y. Guo, P. Titum, D. A. Abanin, A. V. Gorshkov,
Locality and Heating in Periodically Driven, Power-law Interacting Systems,
Phys. Rev. A 100, 052103 (2019); arXiv:1908.02773 [quant-ph].
Selected as an Editors' Suggestion.

111. R. Belyansky, J. T. Young, P. Bienias, Z. Eldredge, A. M. Kaufman, P. Zoller, A. V. Gorshkov,
Nondestructive cooling of an atomic quantum register via state-insensitive Rydberg interactions,
Phys. Rev. Lett. 123, 213603 (2019); arXiv:1907.11156 [quant-ph].

110. S. Subhankar, P. Bienias, P. Titum, T-C. Tsui, Y. Wang, A. V. Gorshkov, S. L. Rolston, J. V. Porto,
Floquet engineering of optical lattices with spatial features and periodicity below the diffraction limit,
New J. Phys. 21, 113058 (2019); arXiv:1906.07646 [cond-mat.quant-gas].

109. N. Maskara, A. Deshpande, M. C. Tran, A. Ehrenberg, B. Fefferman, A. V. Gorshkov, *Complexity phase diagram for interacting and long-range bosonic Hamiltonians*, Phys. Rev. Lett. 129, 150604 (2022); arXiv:1906.04178 [quant-ph].

108. G. Pagano, A. Bapat, P. Becker, K. S. Collins, A. De, P. W. Hess, H. B. Kaplan, A. Kyprianidis, W. L. Tan, C. Baldwin, L. T. Brady, A. Deshpande, F. Liu, S. Jordan, A. V. Gorshkov, C. Monroe, *Quantum Approximate Optimization with a Trapped-Ion Quantum Simulator*, Proc. Natl. Acad. Sci. U.S.A. 117, 25396 (2020); arXiv:1906.02700 [quant-ph].

107. A. Y. Guo, M. C. Tran, A. M. Childs, A. V. Gorshkov, Z.-X. Gong, *Signaling and Scrambling with Strongly Long-Range Interactions*, Phys. Rev. A 102, 010401(R) (2020); arXiv:1906.02662 [quant-ph].

106. J. T. Young, A. V. Gorshkov, M. Foss-Feig, M. F. Maghrebi, *Non-equilibrium fixed points of coupled Ising models*, Phys. Rev. X 10, 011039 (2020); arXiv:1903.02569 [cond-mat.quant-gas].

105. F. Liu, R. Lundgren, P. Titum, J. R. Garrison, A. V. Gorshkov, *Circuit Complexity across a Topological Phase Transition*, Phys. Rev. Research 2, 013323 (2020); arXiv:1902.10720 [quant-ph].

104. K. Qian, Z. Eldredge, W. Ge, G. Pagano, C. Monroe, J. V. Porto, A. V. Gorshkov, *Heisenberg-Scaling Measurement Protocol for Analytic Functions with Quantum Sensor Networks*, Phys. Rev. A 100, 042304 (2019); arXiv:1901.09042 [quant-ph]. U.S. Patent 11,562,049.

103. M. F. Maghrebi, A. V. Gorshkov, J. D. Sau, *Fluctuation-induced torque on a topological insulator out of thermal equilibrium*, Phys. Rev. Lett. 123, 055901 (2019); arXiv:1811.06080 [cond-mat.mes-hall]. Selected as an Editors' Suggestion. Featured in a Physics Synopsis "Topological Insulators Do the Twist" by M. Stephens.

102. F. Liu, R. Lundgren, P. Titum, G. Pagano, J. Zhang, C. Monroe, A. V. Gorshkov, *Confined Quasiparticle Dynamics in Long-Range Interacting Quantum Spin Chains*, Phys. Rev. Lett. 122, 150601 (2019); arXiv:1810.02365 [cond-mat.quant-gas].

101. P. Titum, J. T. Iosue, J. R. Garrison, A. V. Gorshkov, Z.-X. Gong, *Probing ground-state phase transitions through quench dynamics*, Phys. Rev. Lett. 123, 115701 (2019); arXiv:1809.04493 [cond-mat.quant-gas].

100. T. Graß, P. Bienias, M. J. Gullans, R. Lundgren, J. Maciejko, A. V. Gorshkov, *Fractional quantum Hall phases of bosons with tunable interactions: From the Laughlin liquid to a fractional Wigner crystal*, Phys. Rev. Lett. 121, 253403 (2018); arXiv:1809.04493 [cond-mat.quant-gas].

99. F. Liu, J. R. Garrison, D.-L. Deng, Z.-X. Gong, A. V. Gorshkov, *Asymmetric Particle Transport and Light-Cone Dynamics Induced by Anyonic Statistics*, Phys. Rev. Lett. 121, 250404 (2018); arXiv:1809.02614 [cond-mat.quant-gas]. Selected as an Editors' Suggestion.

98. Y. Wang, M. J. Gullans, A. Browaeys, J. V. Porto, D. E. Chang, A. V. Gorshkov,
Single-photon bound states in atomic ensembles,
arXiv:1809.01147 [quant-ph].

97. A. Bapat, Z. Eldredge, J. R. Garrison, A. Desphande, F. T. Chong, A. V. Gorshkov,
Unitary Entanglement Construction in Hierarchical Networks,
Phys. Rev. A 98, 062328 (2018); arXiv:1808.07876 [quant-ph].

96. M. C. Tran, A. Y. Guo, Y. Su, J. R. Garrison, Z. Eldredge, M. Foss-Feig, A. M. Childs, A. V. Gorshkov,
Locality and digital quantum simulation of power-law interactions,
Phys. Rev. X 9, 031006 (2019); arXiv:1808.05225 [quant-ph].

95. P. Bienias, S. Subhankar, Y. Wang, T.-C. Tsui, F. Jendrzejewski, T. Tiecke, G. Juzeliunas, L. Jiang, S. L. Rolston, J. V. Porto, A. V. Gorshkov,
Coherent optical nano-tweezers for ultra-cold atoms,
Phys. Rev. A 102, 013306 (2020); arXiv:1808.02487 [quant-ph].

94. S.-K. Chu, G. Zhu, J. R. Garrison, Z. Eldredge, A. Valdés Curiel, P. Bienias, I. B. Spielman, and A. V. Gorshkov,
Scale-Invariant Continuous Entanglement Renormalization of a Chern Insulator,
Phys. Rev. Lett. 122, 120502 (2019); arXiv:1807.11486 [quant-ph].

93. P. Bienias, J. Douglas, A. Paris-Mandoki, P. Titum, I. Mirgorodskiy, C. Tresp, E. Zeuthen, M. J. Gullans, M. Manzoni, S. Hofferberth, D. Chang, A. V. Gorshkov,
Photon propagation through dissipative Rydberg media at large input rates,
Phys. Rev. Research 2, 033049 (2020); arXiv:1807.07586 [quant-ph].

92. N. M. Sundaresan, R. Lundgren, G. Zhu, A. V. Gorshkov, A. A. Houck,
Interacting Qubit-Photon Bound States with Superconducting Circuits,
Phys. Rev. X 9, 011021 (2019); arXiv:1801.10167 [quant-ph].

91. Y. Wang, S. Subhankar, P. Bienias, M. Łącki, T.-C. Tsui, M. A. Baranov, A. V. Gorshkov, P. Zoller, J. V. Porto, and S. L. Rolston,
Dark state optical lattice with sub-wavelength spatial structure,
Phys. Rev. Lett. 120, 083601 (2018); arXiv:1712.00655 [cond-mat.quant-gas].
Selected as an Editors' Suggestion. Featured in a Physics Viewpoint: B. Gadway, Physics 11, 19 (2018).

90. C. R. Murray, I. Mirgorodskiy, C. Tresp, C. Braun, A. Paris-Mandoki, A. V. Gorshkov, S. Hofferberth, and T. Pohl,
Photon Subtraction by Many-Body Decoherence,
Phys. Rev. Lett. 120, 113601 (2018); arXiv:1710.10047 [quant-ph].
Selected as an Editors' Suggestion,
Featured by Science Daily.

89. M. T. Manzoni, M. Moreno-Cardoner, A. Asenjo-Garcia, J. V. Porto, A. V. Gorshkov, and D. E. Chang,
Optimization of photon storage fidelity in ordered atomic arrays,
New J. Phys. 20, 083048 (2018); arXiv:1710.06312 [quant-ph].

88. J. T. Young, T. Boulier, E. Magnan, E. A. Goldschmidt, R. M. Wilson, S. L. Rolston, J. V. Porto, A. V. Gorshkov,
Dissipation induced dipole blockade and anti-blockade in driven Rydberg systems,
Phys. Rev. A 97, 023424 (2018); arXiv:1710.01752 [quant-ph].

87. S. V. Syzranov, A. V. Gorshkov, V. M. Galitski,
Interaction-induced transition in the quantum chaotic dynamics of a disordered metal,
Ann. Phys. 405, 1 (2019); arXiv:1709.09296 [cond-mat.mes-hall].

86. T. Boulier, E. Magnan, C. Bracamontes, J. Maslek, E. A. Goldschmidt, J. T. Young, A. V. Gorshkov, S. L. Rolston, J. V. Porto,
Spontaneous avalanche dephasing in large Rydberg ensembles,
Phys. Rev. A 96, 053409 (2017); arXiv:1709.02460 [quant-ph].

85. M. J. Gullans, S. Diehl, S. T. Rittenhouse, B. P. Ruzic, J. P. D'Incao, P. Julienne, A. V. Gorshkov, J. M. Taylor,
Efimov States of Strongly Interacting Photons,
Phys. Rev. Lett. 119, 233601 (2017); arXiv:1709.01955 [physics.atom-ph].

84. Q.-Y. Liang, A. V. Venkatramani, S. H. Cantu, T. L. Nicholson, M. J. Gullans, A. V. Gorshkov, J. D. Thompson, C. Chin, M. D. Lukin, V. Vuletic,
Observation of three-photon bound states in a quantum nonlinear medium,
Science 359, 783 (2018); arXiv:1709.01478 [quant-ph].
Featured by Newsweek and numerous other news media.

83. J. Zhang, G. Pagano, P. W. Hess, A. Kyprianidis, P. Becker, H. Kaplan, A. V. Gorshkov, Z.-X. Gong, C. Monroe,
Observation of a Many-Body Dynamical Phase Transition with a 53-Qubit Quantum Simulator,
Nature 551, 601 (2017); arXiv:1708.01044 [quant-ph].
Featured by Gizmodo, International Business Times, Discover Magazine, Science Daily, and numerous other news media.

82. W. Ge, K. Jacobs, Z. Eldredge, A. V. Gorshkov, M. Foss-Feig,
Distributed Quantum Metrology with Linear Networks and Separable Inputs,
Phys. Rev. Lett. 121, 043604 (2018); arXiv:1707.06655 [quant-ph].

81. M. C. Tran, J. R. Garrison, Z.-X. Gong, A. V. Gorshkov,
Lieb-Robinson bounds on n-partite connected correlations,
Phys. Rev. A 96, 052334 (2017); arXiv:1705.04355 [quant-ph].

80. S.V. Syzranov, A. V. Gorshkov, V. Galitski,
Out-of-time-order correlators in finite open systems,
Phys. Rev. B 97, 161114(R) (2018); arXiv:1704.08442 [cond-mat.mes-hall].

79. A. Deshpande, B. Fefferman, M. Foss-Feig, A. V. Gorshkov,
Dynamical Phase Transitions in Sampling Complexity,
Phys. Rev. Lett. 121, 030501 (2018); arXiv:1703.05332 [quant-ph].

78. M. Foss-Feig, J. T. Young, V. V. Albert, A. V. Gorshkov, M. F. Maghrebi,
A solvable family of driven-dissipative many-body systems,
Phys. Rev. Lett. 119, 190402 (2017); arXiv:1703.04626 [quant-ph].

77. M. Foss-Feig, Z.-X. Gong, A. V. Gorshkov, and C. W. Clark,
Entanglement and spin-squeezing without infinite-range interactions,
arXiv:1612.07805 [cond-mat.quant-gas].

76. Z. Eldredge, Z.-X. Gong, J. T. Young, A. Hamed Moosavian, M. Foss-Feig, A. V. Gorshkov,
Fast Quantum State Transfer and Entanglement Renormalization Using Long-Range Interactions,
Phys. Rev. Lett. 119, 170503 (2017); arXiv:1612.02442 [quant-ph].
U.S. Patent 10,432,320; World Intellectual Property Organization Patent WO/2018/106506.

75. Z.-X. Gong, M. Xu, M. Foss-Feig, J. K. Thompson, A. M. Rey, M. Holland, A. V. Gorshkov,
Steady-state superradiance with Rydberg polaritons,
arXiv:1611.00797 [quant-ph].

74. M. E. Beverland, J. Haah, G. Alagic, G. K. Campbell, A. M. Rey, A. V. Gorshkov,
Spectrum estimation of density operators with alkaline-earth atoms,
Phys. Rev. Lett. 120, 025301 (2018); arXiv:1608.02045 [quant-ph].
QIP 2016 talk.

73. Z. Eldredge, M. Foss-Feig, J. A. Gross, S. L. Rolston, A. V. Gorshkov,
Optimal and Secure Measurement Protocols for Quantum Sensor Networks,
Phys. Rev. A 97, 042337 (2018); arXiv:1607.04646 [quant-ph].
Selected for the Hot Topics session of QCrypt 2016.
U.S. Patent 10,007,885.

72. B. Neyenhuis, J. Smith, A. C. Lee, J. Zhang, P. Richerme, P. W. Hess, Z.-X. Gong, A. V. Gorshkov, C. Monroe,
Observation of Prethermalization in Long-Range Interacting Spin Chains,
Sci. Adv. 3, e1700672 (2017); arXiv:1608.00681 [quant-ph].

71. B. Fefferman, M. Foss-Feig, A. V. Gorshkov,
Exact sampling hardness of Ising spin models,
Phys. Rev. A 96, 032324 (2017); arXiv:1701.03167 [quant-ph].

70. Z.-X. Gong, M. Foss-Feig, F. G. S. L. Brandão, A. V. Gorshkov,
Entanglement area laws for long-range interacting systems,
Phys. Rev. Lett. 119, 050501 (2017); arXiv:1702.05368 [quant-ph].

69. E. Zeuthen, M. J. Gullans, M. F. Maghrebi, A. V. Gorshkov,
Correlated photon dynamics in dissipative Rydberg media,
Phys. Rev. Lett. 119, 043602 (2017); arXiv:1608.06068 [quant-ph].

68. M. F. Maghrebi, Z.-X. Gong, A. V. Gorshkov,
Continuous symmetry breaking in 1D long-range interacting quantum systems,
Phys. Rev. Lett. 119, 023001 (2017); arXiv:1510.01325 [cond-mat.quant-gas].

67. V. R. Overbeck, M. F. Maghrebi, A. V. Gorshkov, H. Weimer,
Multicritical behavior in dissipative Ising models,
Phys. Rev. A 95, 042133 (2017); arXiv:1606.08863 [cond-mat.stat-mech].

66. M. Foss-Feig, P. Niroula, J. T. Young, M. Hafezi, A. V. Gorshkov, R. M. Wilson, M. F. Maghrebi,
Emergent equilibrium in many-body optical bistability,
Phys. Rev. A 95, 043826 (2017); arXiv:1611.02284 [quant-ph].

65. S. Ganeshan, A. V. Gorshkov, V. Gurarie, V. M. Galitski,
Exactly soluble model of boundary degeneracy,
Phys. Rev. B 95, 045309 (2017); arXiv:1604.02089 [cond-mat.str-el].
Selected as an Editors' Suggestion.

64. F. Jendrzejewski, S. Eckel, T. G. Tiecke, G. Juzeliūnas, G. K. Campbell, L. Jiang, A. V. Gorshkov,
Subwavelength-width optical tunnel junctions for ultracold atoms,
Phys. Rev. A 94, 063422 (2016); arXiv:1609.01285 [cond-mat.quant-gas].

63. Z. Eldredge, P. Solano, D. Chang, A. V. Gorshkov,
Self-organization of atoms coupled to a chiral reservoir,
Phys. Rev. A 94, 053855 (2016); arXiv:1605.06522 [quant-ph].

62. C. R. Murray, A. V. Gorshkov, T. Pohl,
Many-body decoherence dynamics and optimized operation of a single-photon switch,
New J. Phys. 18, 092001 (2016); arXiv:1607.01984 [quant-ph].

61. R. M. Wilson, K. W. Mahmud, A. Hu, A. V. Gorshkov, M. Hafezi, M. Foss-Feig,
Collective phases of strongly interacting cavity photons,
Phys. Rev. A 94, 033801 (2016); arXiv:1601.06857 [quant-ph].

60. M. J. Gullans, Y. Wang, J. D. Thompson, Q.-Y. Liang, V. Vuletic, M. D. Lukin, A. V. Gorshkov,
Effective Field Theory for Rydberg Polaritons,
Phys. Rev. Lett. 117, 113601 (2016); arXiv:1605.05651 [physics.atom-ph].

59. Z.-X. Gong, M. F. Maghrebi, A. Hu, M. Foss-Feig, P. Richerme, C. Monroe, A. V. Gorshkov,
Kaleidoscope of quantum phases in a long-range interacting spin-1 chain,
Phys. Rev. B 93, 205115 (2016); arXiv:1510.02108 [cond-mat.str-el].

58. M. E. Beverland, G. Alagic, M. J. Martin, A. P. Koller, A. M. Rey, and A. V. Gorshkov,
Realizing Exactly Solvable SU(N) Magnets with Thermal Atoms,
Phys. Rev. A 93, 051601(R) (2016); arXiv:1409.3234 [cond-mat.quant-gas].

57. E. A. Goldschmidt, T. Boulier, R. C. Brown, S. B. Koller, J. T. Young, A. V. Gorshkov, S. L. Rolston, J. V. Porto,
Anomalous broadening in driven dissipative Rydberg systems,
Phys. Rev. Lett. 116, 113001 (2016); arXiv:1510.08710 [quant-ph].

56. M. F. Maghrebi, Z.-X. Gong, M. Foss-Feig, A. V. Gorshkov,
Causality and quantum criticality in long-range lattice models,
Phys. Rev. B 93, 125128 (2016); arXiv:1508.00906 [cond-mat.quant-gas].

55. M. F. Maghrebi and A. V. Gorshkov,
Nonequilibrium many-body steady states via Keldysh formalism,
Phys. Rev. B 93, 014307 (2016); arXiv:1507.01939 [cond-mat.quant-gas].

54. Z.-X. Gong, M. F. Maghrebi, A. Hu, M. L. Wall, M. Foss-Feig, and A. V. Gorshkov,
Topological phases with long-range interactions,
Phys. Rev. B 93, 041102(R) (2016); arXiv:1505.03146 [cond-mat.quant-gas].

53. N. Y. Yao, S. D. Bennett, C. R. Laumann, B. L. Lev, and A. V. Gorshkov,
Bilayer fractional quantum Hall states with dipoles,
Phys. Rev. A 92, 033609 (2015); arXiv:1505.03099 [cond-mat.quant-gas].

52. M. F. Maghrebi, M. J. Gullans, P. Bienias, S. Choi, I. Martin, O. Firstenberg, M. D. Lukin, H. P. Büchler, and A. V. Gorshkov,
Coulomb bound states of strongly interacting photons,
Phys. Rev. Lett. 115, 123601 (2015); arXiv:1505.03859 [quant-ph].
Selected as an Editors' Suggestion. Featured by Optics & Photonics News (OPN), photonics.com, and numerous other news media.

51. M. F. Maghrebi, S. Ganeshan, D. J. Clarke, A. V. Gorshkov, and J. D. Sau,
Parafermionic zero modes in ultracold bosonic systems,
Phys. Rev. Lett. 115, 065301 (2105); arXiv:1504.04012 [cond-mat.quant-gas].

50. M. F. Maghrebi, N. Y. Yao, M. Hafezi, T. Pohl, O. Firstenberg, and A. V. Gorshkov,
Fractional Quantum Hall States of Rydberg Polaritons,
Phys. Rev. A 91, 033838 (2015); arXiv:1411.6624 [cond-mat.quant-gas].

49. M. Foss-Feig, Z.-X. Gong, C. W. Clark, and A. V. Gorshkov,
Nearly-linear light cones in long-range interacting quantum systems,
Phys. Rev. Lett. 114, 157201 (2015); arXiv:1410.3466 [quant-ph].
Featured by Science Daily, Nanotechnology Now, Phys.org, Scientific Computing, R&D Magazine, and the ECN Magazine.

48. J. S. Douglas, H. Habibian, C.-L. Hung, A. V. Gorshkov, H. J. Kimble, and D. E. Chang,
Quantum many-body models with cold atoms coupled to photonic crystals,
Nature Photon. 9, 326 (2015); arXiv:1312.2435 [quant-ph].

47. P. Bienias, S. Choi, O. Firstenberg, M. F. Maghrebi, M. Gullans, M. D. Lukin, A. V. Gorshkov, and H. P. Büchler,
Scattering resonances and bound states for strongly interacting Rydberg polaritons,
Phys. Rev. A 90, 053804 (2014); arXiv:1402.7333 [quant-ph].

46. D. Vodola, L. Lepori, E. Ercolessi, A. V. Gorshkov and G. Pupillo,
Kitaev chains with long-range pairing,
Phys. Rev. Lett. 113, 156402 (2014); arXiv:1405.5440 [cond-mat.str-el].

45. Z.-X. Gong, M. Foss-Feig, S. Michalakis, and A. V. Gorshkov,
Persistence of locality in systems with power-law interactions,
Phys. Rev. Lett. 113, 030602 (2014); arXiv:1401.6174 [quant-ph].

44. P. Richerme, Z.-X. Gong, A. Lee, C. Senko, J. Smith, M. Foss-Feig, S. Michalakis, A. V. Gorshkov, and C. Monroe,
Non-local propagation of correlations in long-range interacting quantum systems,
Nature 511, 198 (2014); arXiv:1401.5088 [quant-ph].

43. A. P. Koller, M. Beverland, A. V. Gorshkov, and A. M. Rey,
Beyond the spin model approximation for Ramsey spectroscopy,
Phys. Rev. Lett. 112, 123001 (2014); arXiv:1312.0887 [physics.atom-ph].

42. A. M. Rey, A. V. Gorshkov, C. V. Kraus, M. J. Martin, M. Bishof, M. D. Swallows, X. Zhang, C. Benko, J. Ye, N. D. Lemke, and A. D. Ludlow,
Probing many-body interactions in an optical lattice clock,
Ann. Phys. 430, 311 (2014); arXiv:1310.5248 [cond-mat.quant-gas].

41. O. Firstenberg, T. Peyronel, Q.-Y. Liang, A. V. Gorshkov, M. D. Lukin, and V. Vuletić,
Attractive Photons in a Quantum Nonlinear Medium,
Nature (London) 502, 71 (2013).
Chosen by Physics World as one of ten breakthroughs of 2013. Featured by CNN, the Guardian, and numerous other news media.

40. M. Lemeshko, N. Y. Yao, A. V. Gorshkov, H. Weimer, S. D. Bennett, T. Momose, and S. Gopalakrishnan,
Controllable quantum spin glasses with magnetic impurities embedded in quantum solids,
Phys. Rev. B 88, 014426 (2013); arXiv:1307.1130 [cond-mat.quant-gas].

39. A. V. Gorshkov and K. R. A. Hazzard and A. M. Rey,
Kitaev honeycomb and other exotic spin models with polar molecules,
Mol. Phys. 111, 1908 (2013); arXiv:1301.5636 [cond-mat.quant-gas].

38. M. J. Martin, M. Bishof, M. D. Swallows, X. Zhang, C. Benko, J. von-Stecher, A. V. Gorshkov, A. M. Rey, and J. Ye,
A quantum many-body spin system in an optical lattice clock,
Science 341, 632 (2013); arXiv:1212.6291 [physics.atom-ph].
Featured by the New Scientist, ElectronicsWeekly.com, Science World Report, and other news media.

37. N. Y. Yao, A. V. Gorshkov [co-first author], C. R. Laumann, A. Läuchli, J. Ye, and M. D. Lukin,
Realizing Fractional Chern Insulators with Dipolar Spins,
Phys. Rev. Lett. 110, 185302 (2013); arXiv:1212.4839 [cond-mat.str-el].
Selected as an Editors' Suggestion. Featured in a Physics Viewpoint: M. Daghofer and M. Haque, Physics 6, 49 (2013).

36. A. V. Gorshkov, R. Nath, and T. Pohl,
Dissipative Many-body Quantum Optics in Rydberg Media,
Phys. Rev. Lett. 110, 153601 (2013); arXiv:1211.7060 [quant-ph].

35. S. R. Manmana, E. M. Stoudenmire, K. R. A. Hazzard, A. M. Rey, A. V. Gorshkov,
Topological phases in ultracold polar-molecule quantum magnets,
Phys. Rev. B 87, 081106(R) (2013); arXiv:1210.5518 [cond-mat.quant-gas].

34. N. Y. Yao, Z.-X. Gong, C. R. Laumann, S. D. Bennett, L.-M. Duan, M. D. Lukin, L. Jiang, A. V. Gorshkov,
Quantum Logic between Remote Quantum Registers,
Phys. Rev. A 87, 022306 (2013); arXiv:1206.0014 [quant-ph].

33. N. Y. Yao, C. R. Laumann, A. V. Gorshkov, H. Weimer, L. Jiang, J. I. Cirac, P. Zoller, and M. D. Lukin,
Topologically Protected Quantum State Transfer in a Chiral Spin Liquid,
Nat. Commun. 4, 1585 (2013); arXiv:1110.3788 [quant-ph].

32. N. Y. Yao, C. R. Laumann, A. V. Gorshkov [co-first author], S. D. Bennett, E. Demler, P. Zoller, M. D. Lukin,
Topological Flat Bands from Dipolar Spin Systems,
Phys. Rev. Lett. 109, 266804 (2012); arXiv:1207.4479 [cond-mat.str-el].

31. T. Peyronel, O. Firstenberg, Q.-Y. Liang, S. Hofferberth, A. V. Gorshkov, T. Pohl, M. D. Lukin, and V. Vuletić,
Quantum Nonlinear Optics with Single Photons Enabled by Strongly Interacting Atoms,
Nature (London) 488, 57 (2012).

30. D. E. Chang, L. Jiang, A. V. Gorshkov, and H. J. Kimble,
Cavity QED with atomic mirrors,
New J. Phys. 14, 063003 (2012); arXiv:1201.0643 [quant-ph].

29. N. Y. Yao, L. Jiang, A. V. Gorshkov [co-first author], P. C. Maurer, G. Giedke, J. I. Cirac, and M. D. Lukin,
Scalable Architecture for a Room Temperature Solid-State Quantum Information Processor,
Nat. Commun. 3, 800 (2012); arXiv:1012.2864 [quant-ph].
U.S. Patent 9,317,473; World Intellectual Property Organization Patent WO/2012/082938.

28. K. A. Kuns, A. M. Rey, A. V. Gorshkov,
d-Wave Superfluidity in Optical Lattices of Ultracold Polar Molecules,
Phys. Rev. A 84, 063639 (2011); arXiv:1110.5330 [cond-mat.quant-gas].

27. K. R. A. Hazzard, A. V. Gorshkov, and A. M. Rey,
Spectroscopy of dipolar fermions in 2D pancakes and 3D lattices,
Phys. Rev. A 84, 033608 (2011); arXiv:1106.1718 [cond-mat.quant-gas].

26. A. V. Gorshkov, S. R. Manmana, G. Chen, E. Demler, M. D. Lukin, and A. M. Rey,
Quantum Magnetism with Polar Alkali Dimers,
Phys. Rev. A 84, 033619 (2011); arXiv:1106.1655 [cond-mat.quant-gas].
Featured in a Physics Synopsis.

25. A. V. Gorshkov, S. R. Manmana, G. Chen, J. Ye, E. Demler, M. D. Lukin, and A. M. Rey,
Tunable Superfluidity and Quantum Magnetism with Ultracold Polar Molecules,
Phys. Rev. Lett. 107, 115301 (2011); arXiv:1106.1644 [cond-mat.quant-gas].
Featured in a Physics Synopsis.

24. A. V. Gorshkov, J. Otterbach, M. Fleischhauer, T. Pohl, and M. D. Lukin,
Photon-Photon Interactions via Rydberg Blockade,
Phys. Rev. Lett. 107, 133602 (2011); arXiv:1103.3700 [quant-ph].

23. N. B. Phillips, A. V. Gorshkov, and I. Novikova,
Light Storage in an Optically Thick Atomic Ensemble Under Conditions of Electromagnetically Induced Transparency and Four-Wave Mixing,
Phys. Rev. A 83, 063823 (2011); arXiv:1103.2131 [quant-ph].

22. M. Bishof, Y. Lin, M. D. Swallows, A. V. Gorshkov, J. Ye, and A. M. Rey,
Resolved Atomic Interaction Sidebands in an Optical Clock Transition,
Phys. Rev. Lett. 106, 250801 (2011); arXiv:1102.1016 [quant-ph].

21. N. Y. Yao, L. Jiang, A. V. Gorshkov, Z.-X. Gong, A. Zhai, L.-M. Duan, and M. D. Lukin,
Robust Quantum State Transfer in Random Unpolarized Spin Chains,
Phys. Rev. Lett. 106, 040505 (2011); arXiv:1011.2762 [quant-ph].

20. P. C. Maurer, J. R. Maze, P. L. Stanwix, L. Jiang, A. V. Gorshkov, A. A. Zibrov, B. Harke, J. S. Hodges, A. S. Zibrov, A. Yacoby, D. Twitchen, S. W. Hell, R. L. Walsworth, and M. D. Lukin,
Far-Field Optical Imaging and Manipulation of Individual Spins with Nanoscale Resolution,
Nature Phys. 6, 912 (2010).

19. A. V. Gorshkov, J. Otterbach, E. Demler, M. Fleischhauer, and M. D. Lukin,
Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain,
Phys. Rev. Lett. 105, 060502 (2010); arXiv:1001.0968 [quant-ph].

18. J. B. Brask, L. Jiang, A. V. Gorshkov, V. Vuletic, A. S. Sørensen, and M. D. Lukin,
Fast Entanglement Distribution with Atomic Ensembles and Fluorescent Detection,
Phys. Rev. A 81, 020303(R) (2010); arXiv:0907.3839 [quant-ph].

17. A. M. Rey, A. V. Gorshkov, and C. Rubbo,
Many-Body Treatment of the Collisional Frequency Shift in Fermionic Atoms,
Phys. Rev. Lett. 103, 260402 (2009); arXiv:0907.2245 [physics.atom-ph].

16. A. V. Gorshkov, M. Hermele, V. Gurarie, C. Xu, P. S. Julienne, J. Ye, P. Zoller, E. Demler, M. D. Lukin, and A. M. Rey,
Two-Orbital SU(N) Magnetism with Ultracold Alkaline-Earth Atoms,
Nature Phys. 6, 289 (2010); arXiv:0905.2610 [cond-mat.quant-gas].

15. N. B. Phillips, A. V. Gorshkov, and I. Novikova,
Slow Light Propagation and Amplification via Electromagnetically Induced Transparency and Four-Wave Mixing in an Optically Dense Atomic Vapor,
J. Mod. Opt. 56, 1916 (2009); arxiv:0903.3937 [quant-ph].

14. A. V. Gorshkov, A. M. Rey, A. J. Daley, M. M. Boyd, J. Ye, P. Zoller, and M. D. Lukin,
Alkaline-Earth-Metal Atoms as Few-Qubit Quantum Registers,
Phys. Rev. Lett. 102, 110503 (2009); arXiv:0812.3660 [quant-ph].

13. N. B. Phillips, A. V. Gorshkov, and I. Novikova,
Optimal Light Storage in Atomic Vapor,
Phys. Rev. A 78, 023801 (2008); arXiv:0805.3348 [quant-ph].

12. I. Novikova, N. B. Phillips, and A. V. Gorshkov,
Optimal Light Storage with Full Pulse Shape Control,
Phys. Rev. A 78, 021802(R) (2008); arXiv:0805.1927 [quant-ph].

11. T. Hong, A. V. Gorshkov, D. Patterson, A. S. Zibrov, J. M. Doyle, M. D. Lukin, and M. G. Prentiss,
Realization of Coherent Optically Dense Media via Buffer-Gas Cooling,
Phys. Rev. A 79, 013806 (2009); arXiv:0805.1416 [quant-ph].

10. A. V. Gorshkov, P. Rabl, G. Pupillo, A. Micheli, M. D. Lukin, P. Zoller, and H. P. Büchler,
Suppression of Inelastic Collisions Between Polar Molecules With a Repulsive Shield,
Phys. Rev. Lett. 101, 073201 (2008); arXiv:0805.0457 [cond-mat.stat-mech].

9. L. Jiang, G. K. Brennen, A. V. Gorshkov, K. Hammerer, M. Hafezi, E. Demler, M. D. Lukin, and P. Zoller,
Anyonic Interferometry and Protected Memories in Atomic Spin Lattices,
Nature Phys. 4, 482 (2008); arXiv:0711.1365 [quant-ph].

8. A. V. Gorshkov, T. Calarco, M. D. Lukin, and A. S. Sørensen,
Photon Storage in Λ-Type Optically Dense Atomic Media. IV. Optimal Control using Gradient Ascent,
Phys. Rev. A 77 , 043806 (2008); arXiv:0710.2698 [quant-ph].

7. A. V. Gorshkov, L. Jiang, M. Greiner, P. Zoller, and M. D. Lukin,
Coherent Quantum Optical Control with Sub-wavelength Resolution,
Phys. Rev. Lett. 100, 093005 (2008); arXiv:0706.3879 [quant-ph].

6. M. K. Henry, A. V. Gorshkov, Y. S. Weinstein, P. Cappellaro, J. Emerson, N. Boulant, J. S. Hodges, C. Ramanathan, T. F. Havel, R. Martinez, and D. G. Cory,
Signatures of Incoherence in a Quantum Information Processor,
Quantum Inf. Process. 6, 431 (2007); arXiv:0705.3666 [quant-ph].

5. I. Novikova, A. V. Gorshkov, D. F. Phillips, A. S. Sørensen, M. D. Lukin, and R. L. Walsworth,
Optimal Control of Light Pulse Storage and Retrieval,
Phys. Rev. Lett. 98, 243602 (2007); quant-ph/0702266.

4. A. V. Gorshkov, A. André, M. D. Lukin, and A. S. Sørensen,
Photon Storage in Λ-Type Optically Dense Atomic Media. III. Effects of Inhomogeneous Broadening,
Phys. Rev. A 76, 033806 (2007); quant-ph/0612084.

3. A. V. Gorshkov, A. André, M. D. Lukin, and A. S. Sørensen,
Photon Storage in Λ-Type Optically Dense Atomic Media. II. Free-Space Model,
Phys. Rev. A 76, 033805 (2007); quant-ph/0612083.

2. A. V. Gorshkov, A. André, M. D. Lukin, and A. S. Sørensen,
Photon Storage in Λ-Type Optically Dense Atomic Media. I. Cavity Model,
Phys. Rev. A 76, 033804 (2007); quant-ph/0612082.

1. A. V. Gorshkov, A. André, M. Fleischhauer, A. S. Sørensen, and M. D. Lukin,
Universal Approach to Optimal Photon Storage in Atomic Media,
Phys. Rev. Lett. 98, 123601 (2007); quant-ph/0604037.

Other Publications

6. I. C. Cloët *et al.*,
Opportunities for Nuclear Physics & Quantum Information Science,
arXiv:1903.05453 [nucl-th].

5. A.V. Gorshkov,
Quantum gases: The high-symmetry switch,
Nature Phys. 10, 708 (2014).

4. O. Firstenberg, M.D. Lukin, T. Peyronel, Q.-Y. Liang, V. Vuletic, A.V. Gorshkov, S. Hofferberth, and T. Pohl,
Quantum Nonlinear Optics: Strongly Interacting Photons,
Opt. Photonics News 24, 48 (2013).

3. M. Klein, Y. Xiao, A. V. Gorshkov, M. Hohensee, C. D. Leung, M. R. Browning, D. F. Phillips, I. Novikova, and R. L. Walsworth,
Optimizing Slow and Stored Light for Multidisciplinary Applications,
Proc. SPIE 6904, 69040C (2008); arXiv:0807.4941 [quant-ph].

2. P. Walther, M. D. Eisaman, A. Nemiroski, A. V. Gorshkov, A. S. Zibrov, A. Zeilinger, and M. D. Lukin,
Multi-photon Entanglement: From Quantum Curiosity to Quantum Computing and Quantum Repeaters,
Proc. SPIE 6664, 66640G (2007).

1. I. Novikova, A. V. Gorshkov, D. F. Phillips, Y. Xiao, M. Klein, and R. L. Walsworth,
Optimization of Slow and Stored Light in Atomic Vapor,
Proc. SPIE 6482, 64820M (2007).

Invited Talks

223. *Readout-Free Majority Decoding via Asymmetric Rydberg Antiblockade*, The 55th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2026.

222. *Quantum Sensor Networks*, Duke Quantum Center Seminar, Duke University, Durham, NC, USA, December 2025.

221. *Quantum Sensor Networks*, 2nd Mechanick Quantum Biosensing Workshop, University of Maryland, College Park, MD, USA, October 2025.

220. *Quantum Sensor Networks*, Physics and Astronomy Colloquium, University of New Mexico, Albuquerque, NM, USA, August 2025.

219. *Time-independence does not limit information flow*, CQuIC Seminar, University of New Mexico, Albuquerque, NM, USA, August 2025.

218. *Time-independence does not limit information flow*, KITP Program "Noise-robust Phases of Quantum Matter," UCSB, CA, USA, August 2025.

217. *Time-independence does not limit information flow*, Conference on "Long-Range Interactions and Dynamics in Complex Quantum Systems", NORDITA, Stockholm, Sweden, July 2025.

216. *Quantum Sensor Networks*, Optical Sensing Congress, Long Beach, CA, USA, July 2025.

215. *Quantum Sensor Networks*, Atomic Physics Gordon Research Conference, Salve Regina University, Newport, RI, USA, June 2025.

214. *Graphs and Graph States in Quantum*, Workshop on Quantum Graph States: Bridging Classical Theory and Quantum Innovation, Virginia Tech, Arlington, VA, USA, May 2025.

213. *Quantum Sensor Networks*, CQT (Centre for Quantum Technologies) Colloquium, Singapore, May 2025.

212. *The Future of Hamiltonian Simulation*, FTL (Accelerating Fault-Tolerant Quantum Logic) Townhall Meeting, UCLA, Los Angeles, CA, USA, May 2025.

211. *Quantum Sensor Networks*, Workshop "FTQM-CV: Fault Tolerant Quantum Metrology in Continuous Variables", University of Maryland, College Park, MD, USA, May 2025.

210. *Quantum Sensor Networks*, Harvard-MIT Center for Ultracold Atoms (CUA) Seminar, Harvard University, Cambridge, MA, USA, April 2025.

209. *Quantum Sensor Networks*, Vienna Center for Quantum Science and Technology (VCQ) Colloquium, Vienna, Austria, April 2025.

208. *Quantum Sensor Networks*, APS March Meeting (Global Physics Summit), Anaheim, CA, USA, March 2025.

207. *Navigating the Quantum IP Frontier: Strategies for Innovation and Development*, 2025 annual AUTM meeting, National Harbor, Maryland, March 2025.

206. *Quantum Sensor Networks*, ECE Colloquium, University of Minnesota, Minneapolis, February 2025.

205. *Distributed Quantum Sensing*, SPIE Photonics West, San Francisco, January 2025.

204. *Quantum Sensors Networks*, NP-AMO QIS Workshop, University of Massachusetts Boston, January 2025.

203. *Entanglement Advantage in Sensing Spatially Correlated Noise*, The 54th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2025.

202. *Quantum Sensors Networks*, NV Quantum Sensing Mini Workshop, University of Maryland, November 2024.

201. *Quantum Sensors*, virtual lecture series "Quantum Thursdays", hosted by the Co-design Center for Quantum Advantage, November 2024.

200. *Analog Quantum Simulation with Trapped Ions*, 1st Workshop on "Advancing Quantum Computation Beyond Gate-Model (BGM)", University of Maryland, College Park, MD, USA, October 2024.

199. *Anticoncentration and Entanglement in Gaussian Boson Sampling*, Workshop on "The Power of Near-Term Quantum Experiments: Algorithms, Noise, and Quantum Advantage beyond NISQ", Institute for Mathematical and Statistical Innovation, University of Chicago, IL, USA, September 2024.

198. *Quantum Sensor Networks*, 4th Workshop on Quantum Repeaters and Networks, Montreux, Switzerland, September 2024

197. *Many-body physics and technology with Rydberg atoms*, 10th International Symposium on Cold Atom Physics (ISCAP-X), Shanghai, China, June 2024.

196. *Distributed quantum sensing*, Distributed Quantum Computing and Cryptography Workshop, Virginia Tech's Arlington Research Center, Arlington, VA, USA, June 2024.

195. *Many-body physics and technology with Rydberg atoms*, 55th meeting of the APS Division of AMO Physics (DAMOP), Fort Worth, TX, USA, June 2024.

194. *Many-body physics and technology with Rydberg atoms*, Georgia Tech/GTRI AMO Seminar, Georgia Tech, Atlanta, GA, USA, May 2024.

193. *Many-body physics and technology with Rydberg atoms*, Quantum Information Science and Engineering (iQuISE) Seminar, MIT, Cambridge, MA, USA, April 2024.

192. *Passive Error Correction*, ARQC (DOE Office of Science Accelerated Research in Quantum Computing) Virtual Seminar, April 2024.

191. *Many-body physics with synthetic quantum matter*, Condensed Matter Theory Seminar, Yale University, New Haven, CT, USA, February 2024.

190. *Rydberg-based photon counting and passive error correction*, The 54th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2024.

189. *Bound states in photonic and atomic crystals*, Quantum Innovators Workshop, Institute for Quantum Computing, Waterloo, Canada, November 2023.

188. *Passive error correction and sensing with erasure qubits*, CIFAR's Quantum Information Science Program Meeting, Banff Centre for Arts and Creativity, Banff, Canada, October 2023.

187. *Passive error correction and distributed sensing*, JQI Seminar, Joint Quantum Institute, University of Maryland, College Park, MD, October 2023.

186. *Passive error correction and distributed sensing*, 2nd International Conference on Emerging Quantum Technology (ICEQT 2023), Hefei, China, September 2023.

185. *An Overview of Applications of Quantum Networks*, Quantum Networks Workshop (QuNeW), The Wylie Center, Beverly, MA, July 2023.

184. *Speed Limits on the Propagation of Quantum Information, Part 2*, The 3rd Condensed Matter Summer School "Dynamics and Quantum Information in Many-body Systems," University of Minnesota, June 2023.

183. *Speed Limits on the Propagation of Quantum Information, Part 1*, The 3rd Condensed Matter Summer School "Dynamics and Quantum Information in Many-body Systems," University of Minnesota, June 2023.

182. *Quantum Sensing and Quantum Computing*, NIST Frontiers, NIST Gaithersburg, June 2023.

181. *Quantum optics with photonic and atomic crystals*, 3rd Workshop on Waveguide QED (WQED23), Erice, Italy, May 2023.

180. *Quantum Sensor Networks*, "Quantum Networks" Workshop, CUNY Graduate Center, May 2023.

179. *Quantum Technology*, Center for Nanotechnology Research and Education Seminar, University of the District of Columbia, April 2023.

178. *Quantum Sensor Networks*, Physics Colloquium, Virginia Commonwealth University, March 2023.

177. *Quantum and Classical Complexity of Learning Hydrodynamics*, DARPA Turbulence Workshop (virtual), March 2023.

176. *Quantum Sensor Networks*, ECE Colloquium, University of Washington, Seattle, WA, USA, January 2023.

175. *Quantum Sensor Networks*, The 53rd Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2023.

174. *Candidate for a passively protected quantum memory in two dimensions*, Theory Colloquium, CU Boulder, October 2022.

173. *Quantum Sensor Networks*, Workshop on Secure Networks of Quantum Sensors, Sorbonne Université, October 2022.

172. *Candidate for a passively protected quantum memory in two dimensions*, Quantum Computing Seminar, George Mason University, October 2022.

171. *Candidate for a passively protected quantum memory in two dimensions*, QuIST (Quantum Information, Spacetime, and Topological Matter) Webinar Series, September 2022.

170. *Rydberg mediated photon-photon interactions*, Advanced SRitp and GiRYD School on Giant Interactions in Rydberg Systems, Weizmann Institute of Science, Rehovot, Israel, September 2022.

169. *Candidate for a passively protected quantum memory in two dimensions*, NSF Workshop on Quantum Advantage and Next Steps, University of Chicago, August 2022.

168. *Candidate for a passively protected quantum memory in two dimensions*, IBM-Qiskit Quantum Information Science Seminar (virtual), July 2022.

167. *Can error-prone quantum bits correct themselves*, Science Foo Camp ("Sci Foo") 2022, X (formerly Google X), Mountain View, CA, USA, June 2022.

166. *Quantum Sensor Networks*, TechConnect World 2022, Washington, DC, USA, June 2022.

165. *Quantum Sensor Networks*, Quantum Engineering Workshop (virtual), California Institute of Technology, Pasadena, CA, USA, May 2022.

164. *Dynamics of quantum systems with long-range interactions*, NTML(BRL)-APCTP Seminar Series: Topological Matter out of Equilibrium (virtual), POSTECH, Pohang, Korea, May 2022.

163. *A Brief Tour of Many Applications of Quantum Networking*, Mini-Symposium: A Discussion of Applications of Quantum Networks (virtual), NIST, January 2022.

162. *Efficient Quantum Computation with Long-Range Interactions*, ASCR Quantum Computing Testbeds Stakeholder Workshop (virtual), December 2021.

161. *Many-body physics with Rydberg atoms*, IQuS Workshop "Scientific Quantum Computing and Simulation on Near-Term Devices: Quantum Simulations of Strongly Correlated Systems" (virtual), November 2021.

160. *Quantum Sensor Networks*, IEEE Quantum Week (virtual), October 2021.

159. *Quantum Optics and Information III*, 2021 Boulder Summer School "Ultracold Matter" (virtual), July 2021.

158. *Quantum Optics and Information II*, 2021 Boulder Summer School "Ultracold Matter" (virtual), July 2021.

157. *Quantum Optics and Information I*, 2021 Boulder Summer School "Ultracold Matter" (virtual), July 2021.

156. *Universality in one-dimensional scattering with general dispersion relations*, 2nd Workshop on Waveguide QED (virtual), June 2021.

155. *Dynamics of many-body quantum systems*, CMT Seminar, Technical University of Munich, June 2021.

154. *QIS-AMO-CM Interface: Lessons for High-energy and Nuclear Physics in the Quantum Simulation Era*, Second Quantum Simulation for Strong Interactions (QuaSi) workshop, May 2021.

153. *A New Quantum Technology Revolution*, Sci Foo Alumni Lighting Talk series, May 2021.

152. *Driven-dissipative stabilization of cat qubits and symmetry breaking*, Spin Phenomena Interdisciplinary Center (SPICE) Workshop "Dissipative Phases of Entangled Quantum Matter", May 2021.

151. *Dynamics of quantum systems with long-range interactions*, Benasque Center for Sciences online meeting "Entanglement in Strongly Correlated Systems", February 2021.

150. *Optimal protocols in quantum annealing and QAOA problems*, Q2B conference on "Practical Quantum Computing" (virtual), December 2020.

149. *Quantum Sensor Networks*, Quantum Network Grand Challenge Seminar, NIST Gaithersburg (virtual), December 2020.

148. *Dynamics of quantum systems with long-range interactions*, Seminar, Helen Diller Quantum Center, Technion, Israel (virtual), November 2020.

147. *Dynamics of quantum systems with long-range interactions*, Colloquium, Department of Physics and Astronomy, University of Oklahoma, Norman, OK (virtual), September 2020.

146. *Dynamics of quantum systems with long-range interactions*, Virtual AMO Seminar, August 2020.

145. *Dynamics of quantum systems with long-range interactions*, 51st meeting of the APS Division of AMO Physics (DAMOP), Portland, OR (virtual), June 2020.

144. *Dynamics of quantum systems with long-range interactions*, ICFO Online Seminar, Institute of Photonic Sciences (ICFO), Castelldefels, Spain (virtual), May 2020.

143. *Sensing, Entanglement, and Scrambling*, Aspen Winter Conference "Quantum Information Science for Fundamental Physics", Aspen, CO, USA, February 2020.

142. *Dynamics of quantum systems with long-range interactions*, PML Seminar, NIST Boulder, CO, USA, February 2020.

141. *Dynamics of quantum systems with long-range interactions*, PML Seminar, NIST Gaithersburg, MD, USA, February 2020.

140. *Nondestructive cooling of an atomic quantum register via state-insensitive Rydberg Interactions*, The 50th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2020.

139. *Dynamics and quantum supremacy with long-range interactions*, International Workshop on Quantum Computing, Information Processing, and Machine Learning, National Taiwan University, Taipei, Taiwan, December 2019.

138. *Dynamics of quantum systems with long-range interactions*, Atomic Physics Seminar, University of Virginia, Charlottesville, VA, USA, October 2019.

137. *Confined Dynamics in Long-Range-Interacting Quantum Spin Chains*, Joint ITAMP/Aarhus collaborative workshop: Many-body Physics with Cold Ions, ITAMP, Harvard University, Cambridge, MA, USA, October 2019.

136. *Dynamics of quantum systems with long-range interactions*, CUA Seminar, Harvard-MIT Center for Ultracold Atoms, Harvard University, Cambridge, MA, USA, September 2019.

135. *Synthetic Topological Matter*, KITP program "Topological Quantum Matter: Concepts and Realizations", Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, September 2019.

134. *Information Propagation and entanglement generation with long-range interactions*, Condensed Matter Seminar, Duke University, Durham, NC, USA, August 2019.

133. *Quantum information propagation with long-range interactions*, Workshop "Quantum and Classical Systems with Long-Range Interactions", International Institute of Physics, Natal, Brazil, July 2019.

132. *Nondestructive Rydberg-interaction-mediated cooling of neutral atoms*, KITS program for ultracold atoms: "Emergent phenomena in ultracold atoms: merging topology, interaction, and dynamics", Beijing, China, June 2019.

131. *Nondestructive Rydberg-interaction-mediated cooling of neutral atoms*, 50th meeting of the APS Division of AMO Physics (DAMOP), Milwaukee, WI, USA, May 2019.

130. *Optimal Quantum Sensing*, Colloquium, Department of Mathematics, Howard University, Washington, DC, USA, April 2019.

129. *Confined Dynamics in Long-Range-Interacting Quantum Spin Chains*, International Workshop "Constrained Many-body Dynamics", MPIPKS, Dresden, Germany, March 2019.

128. *Nondestructive Rydberg-interaction-mediated cooling of neutral atoms*, "Giant Interactions in Rydberg Systems" Status Workshop, TU Kaiserslautern, Kaiserslautern, Germany, March 2019.

127. *Optimal Quantum Sensing*, Applied and Computational Mathematics Division Seminar, NIST, Gaithersburg, MD, USA, October 2018.

126. *Distributed Quantum Sensing*, INQNET Quantum Transduction Workshop, Caltech, Pasadena, CA, USA, September 2018.

125. *Information Propagation and Entanglement Generation with Long-Range Interactions*, KITP program "The Dynamics of Quantum Information", Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, September 2018.

124. *Few-Body and Many-Body Physics with Photons*, Workshop on Quantum Simulations with Atoms and Light, Aarhus Institute of Advanced Studies at Aarhus University, Denmark, August 2018.

123. *Information Propagation and Entanglement Generation with Long-Range Interactions*, 26th International Conference on Atomic Physics (ICAP), Barcelona, Spain, July 2018.

122. *Quantum Sensor Networks*, IEEE Photonics Society Summer Topicals Meeting "Quantum Networks," Hilton Waikoloa Village, New Town Hall in Hannover, Waikaloa, Hawaii, USA, July 2018.

121. *Information Propagation and Entanglement Generation with Long-Range Interactions*, Workshop "From Few to Many-Body Physics with Dipolar Quantum Gases," New Town Hall in Hannover, Hannover, Germany, June 2018.

120. *Quantum Technology*, Science Foo Camp ("Sci Foo") 2018, X (formerly Google X), Mountain View, CA, USA, June 2018.

119. *Few-Body and Many-Body Physics with Photons*, 1st Workshop on Waveguide QED, Centro Polivalente, Mazara del Vallo, Sicily, Italy, June 2018.

118. *Optimal and Secure Measurement Protocols for Quantum Sensor Networks*, Conference on Lasers and Electro-Optics (CLEO), San Jose Convention Center, San Jose, CA, May 2018.

117. *Dynamics of Synthetic Quantum Matter*, Institute for Condensed Matter Theory Seminar, University of Illinois at Urbana-Champaign, IL, USA, April 2018.

116. *Harnessing Synthetic Quantum Matter*, Center for the Theory of Quantum Matter Seminar, University of Colorado, Boulder, CO, USA, April 2018.

115. *Quantum Sensing with Atoms and Photons*, Workshop on Intersections between Nuclear Physics and Quantum Information, Physics Division, Argonne National Laboratory, March 2018.

114. *Complexity of Sampling as an Order Parameter*, International Workshop on Chaos and Dynamics in Correlated Quantum Matter, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, March 2018.

113. *Harnessing Synthetic Quantum Matter*, Electrical Engineering Department Seminar, Princeton University, Princeton, NJ, USA, February 2018.

112. *Complexity of Sampling as an Order Parameter*, The 48th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2018.

111. *Complexity of Sampling as an Order Parameter*, KITP program "Quantum Physics of Information", Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, November 2017.

110. *Optimal Quantum Sensing*, Canadian Institute for Advanced Research (CIFAR) Quantum Information Science Meeting, Niagara-on-the-Lake, ON, Canada, October 2017.

109. *Optimal and Secure Measurement Protocols for Quantum Sensor Networks*, International Workshop on Quantum Sensing with Quantum Correlated Systems, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, September 2017.

108. *Complexity of Sampling as an Order Parameter*, Workshop "The many facets of non-equilibrium physics: from many body theory to quantum thermodynamics," Mazara del Vallo, Sicily, Italy, September 2017.

107. *Optimal Quantum Sensing*, CQuIC Seminar, University of New Mexico, Albuquerque, NM, USA, August 2017.

106. *Quantum Computers, Quantum Internet, and Quantum Sensors*, Science Foo Camp ("Sci Foo") 2017, Googleplex, Mountain View, CA, USA, August 2017.

105. *Entanglement Generation and Area Law with Long-Range Interactions* , Workshop "Frontiers of Interacting Systems of Rydberg Atoms," ITAMP, Cambridge, MA, USA, June 2017.

104. *Few-Body and Many-Body Physics with Rydberg Polaritons*, 2017 Conference "Quantum Fluids of Light and Matter" (QFLM), Cargèse, Corsica, France, May 2017.

103. *Few-Body and Many-Body Physics with Rydberg Polaritons*, Workshop on quantum light-matter interactions in low dimensions, Institute of Photonic Sciences (ICFO), Castelldefels, Spain, May 2017.

102. *Entanglement Generation and Area Law with Long-Range Interactions*, APS March Meeting, New Orleans, LA, USA, March 2017.

101. *Optimal Quantum Sensing*, Electrical Engineering Department Seminar, Princeton University, Princeton, NJ, USA, February 2017.

100. *Few-Body and Many-Body Physics with Rydberg Polaritons*, The 47th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2017.

99. *Entanglement renormalization and area law with long-range interactions*, Conference on Topological Orders and Emergent Spacetime on Quantum Simulators, Fudan University, Shanghai, China, December 2016.

98. *Applications of Quantum Communication*, Future Directions of Quantum Information Processing Workshop, Basic Research Innovation and Collaboration Center (BRICC), Arlington, VA, USA, August 2016.

97. *Harnessing Quantum Systems with Long-Range Interactions*, Canadian Institute for Advanced Research (CIFAR) Quantum Information Science Program Meeting, University of Maryland, College Park, MD, USA, April 2016.

96. *Harnessing Quantum Systems with Long-Range Interactions*, Atomic Physics Seminar, University of California, Berkeley, CA, USA, March 2016.

95. *Harnessing Quantum Systems with Long-Range Interactions*, James Franck Institute Seminar, University of Chicago, Chicago, IL, USA, February 2016.

94. *Interacting photons*, Meeting of UMD Society of Physics Students, University of Maryland, College Park, MD, USA, February 2016.

93. *Harnessing Quantum Systems with Long-Range Interactions*, Physics and Astronomy Colloquium, Dartmouth College, Hannover, NH, USA, February 2016.

92. *Harnessing Quantum Systems with Long-Range Interactions*, Solid State Seminar, Technion, Haifa, Israel, January 2016.

91. *Topological Phases in Atomic, Molecular, and Optical Systems*, Optics and Atomic Physics Seminar, Weizmann Institute, Rehovot, Israel, January 2016.

90. *Topological Phases in Atomic, Molecular, and Optical Systems*, Physics Colloquium, Bar-Ilan University, Ramat Gan, Israel, January 2016.

89. *Harnessing Quantum Systems with Long-Range Interactions*, The 46th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2016.

88. *Topological Phases in Atomic, Molecular, and Optical Systems*, IQI Seminar, Institute for Quantum Information, IQIM, Caltech, Pasadena, CA, USA, October 2015.

87. *Few-Body and Many-Body Physics with Rydberg Polaritons*, KITP conference "Non-equilibrium dynamics of strongly interacting photons," Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, October 2015.

86. *Topological Phases in Atomic, Molecular, and Optical Systems*, BIRS workshop on Strongly Interacting Topological Phases, Banff, Canada, September 2015.

85. *Few-Body and Many-Body Physics with Rydberg Polaritons*, Workshop "Light-matter interactions in low dimensions," ITAMP, Cambridge, MA, USA, July 2015.

84. *Harnessing Quantum Systems with Long-Range Interactions*, Atomic Physics Gordon Research Conference, Salve Regina University, Newport, RI, USA, June 2015.

83. *Propagation of information in quantum systems with long-range interactions*, Workshop "Quantum Many-Body Systems Far from Equilibrium," Stellenbosch, South Africa, March 2015.

82. *Abelian and non-Abelian topological phases with dipoles*, APS March Meeting, San Antonio, TX, USA, March 2015.

81. *Optimal Spectrum Estimation of Density Operators with Alkaline-Earth Atoms*, APS March Meeting, San Antonio, TX, USA, March 2015.

80. *Few-Body and Many-Body Physics with Rydberg Polaritons*, Workshop on Polariton blockade effects in Rydberg atoms and Semiconductors (POLARYS), Institut d'Optique, Palaiseau, France, December 2014.

79. *Propagation of information in systems with power-law interactions (focus on ion chains)*, Workshop "Quantum Science: Implementations," Centro de Ciencias de Benasque Pedro Pascual, Benasque, Spain, July 2014.

78. *Harnessing Quantum Systems with Long-Range Interactions*, Colloquium, Heidelberg Center for Quantum Dynamics, Heidelberg, Germany, July 2014.

77. *Harnessing Quantum Systems with Long-Range Interactions*, Seminar, Institute of Photonic Sciences (ICFO), Castelldefels, Spain, June 2014.

76. *Harnessing Quantum Systems with Long-Range Interactions*, Quantum Lunch, Los Alamos National Laboratory, Los Alamos, NM, USA, June 2014.

75. *Harnessing Quantum Systems with Long-Range Interactions*, IQI Seminar, Institute for Quantum Information, IQIM, Caltech, Pasadena, CA, USA, April 2014.

74. *Dynamics of Quantum Systems with Long-Range Interactions*, APS March Meeting, Denver, USA, March 2014.

73. *Persistence of locality in systems with power-law interactions*, Workshop "What do we do with a small quantum computer?," IBM T.J. Watson Research Center, Yorktown Heights, NY, USA, December 2013.

72. *Lightsabers in the Making: Quantum Nonlinear Optics at the Single-Photon Level*, Physics Colloquium, Georgetown University, Washington, DC, USA, December 2013.

71. *Propagation of information in systems with long-range interactions*, Workshop on Quantum Dynamics of Low-Dimensional Systems in memory of Adilet Imambekov, Harvard University, Cambridge, MA, USA, September 2013.

70. *Quantum Nonlinear Optics at the Single-Photon Level*, CAMP Seminar, Penn State University, University Park, PA, USA, September 2013.

69. *Quantum Nonlinear Optics at the Single-Photon Level*, Second International Conference on Quantum Technologies, Russian Quantum Center, Moscow, Russia, July 2013.

68. *Dissipative Many-body Quantum Optics in Rydberg Media*, International workshop on Ultracold Rydberg Physics, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, July 2013.

67. *Quantum Nonlinear Optics at the Single-Photon Level*, International Conference on Quantum Information Processing and Communication (QIPC), Florence, Italy, July 2013.

66. *Realizing Topological Phases with Dipolar Spins*, 44th meeting of the APS Division of AMO Physics (DAMOP), Quebec City, Quebec, Canada, June 2013.

65. *Realizing Topological Phases with Dipolar Spins*, KITP conference "New Science with Ultracold Molecules," Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, March 2013.

64. *Realizing Topological Phases with Dipolar Spins*, BIRS workshop on Topological Phenomena in Quantum Dynamics and Disordered Systems, Banff, Canada, February 2013.

63. *Harnessing Quantum Systems with Long-Range Interactions*, JQI Seminar, Joint Quantum Institute, University of Maryland, College Park, MD, USA, January 2013.

62. *Topological Phases in Polar-Molecule Quantum Magnets*, KITP program Fundamental Science and Applications of Ultra-cold Polar Molecules, Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, January 2013.

61. *Topological Phases in Polar-Molecule Quantum Magnets*, The 43rd Winter Colloquium on the Physics of Quantum Electronics, Snowbird, UT, USA, January 2013.

60. *Quantum gases with long-range interactions: from topological phases to interacting photons*, AMO Seminar, JILA, University of Colorado, Boulder, CO, USA, December 2012.

59. *Topological Phases in Polar-Molecule Quantum Magnets*, Seminar, Joint Quantum Institute, NIST, and the University of Maryland, College Park, MD, USA, December 2012.

58. *Topological Phases in Polar-Molecule Quantum Magnets*, AMO Physics Seminar, Department of Physics & Astronomy, University of California, Los Angeles, CA, USA, November 2012.

57. *Quantum Nonlinear Optics with Single Photons*, COHERENCE workshop on Rydberg atoms, CNRS, Gif-sur-Yvette, France, July 2012.

56. *Many-Body Physics with Atomic, Molecular and Optical Systems*, Guest lecture in *Physics 135c - Quantum Mechanics: elementary particles and the universe*, California Institute of Technology, Pasadena, CA, USA, April 2012.

55. *Quantum Magnetism with Polar Molecules: Tunable Generalized t-J Model*, Seminar, Institute for Quantum Information and Matter, California Institute of Technology, Pasadena, CA, USA, March 2012.

54. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Department of Electrical & Computer Engineering, Boston University, Boston, MA, USA, March 2012.

53. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Department of Physics, University of Cambridge, Cambridge, UK, February 2012.

52. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Imperial College London, London, UK, February 2012.

51. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Department of Physics & Astronomy, University of Pittsburgh, Pittsburgh, PA, USA, February 2012.

50. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Department of Applied Physics, Yale University, New Haven, CT, USA, February 2012.

49. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, CQuIC seminar, University of New Mexico, Albuquerque, NM, USA, January 2012.

48. *Many-Body Physics with Atomic, Molecular and Optical Systems*, Seminar, Physics Department, University of Michigan, Ann Arbor, MI, USA, January 2012.

47. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Perimeter Institute, Waterloo, Canada, January 2012.

46. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, University of Waterloo, Waterloo, Canada, January 2012.

45. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, Applied Physics Department, Stanford University, Stanford, CA, USA, January 2012.

44. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, IQOQI, University of Innsbruck, Innsbruck, Austria, December 2011.

43. *Many-Body Physics with Atomic, Molecular and Optical Systems and Methods*, Seminar, University College London, London, UK, November 2011.

42. *Ultracold Polar Molecules to the Rescue*, PMA Chair's Council Meeting, California Institute of Technology, Pasadena, CA, USA, November 2011.

41. *Photon-Photon Interactions via Rydberg Blockade*, Seminar, Institut d'Optique, Palaiseau, France, October 2011.

40. *Photon-Photon Interactions via Rydberg Blockade*, Workshop on Engineering and Control of Quantum Systems, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, October 2011.

39. *Quantum Magnetism with Polar Molecules: Tunable Generalized t-J Model*, Quantum Dynamics Seminar, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, October 2011.

38. *Subwavelength Lattices*, Topical Group: Fundamental Science with Ultracold Molecules, Institute for Theoretical AMO Physics, Harvard University, Cambridge, MA, USA, September 2011.

37. *Quantum Magnetism with Polar Molecules: Tunable Generalized t-J Model*, Topical Group: Fundamental Science with Ultracold Molecules, Institute for Theoretical AMO Physics, Harvard University, Cambridge, MA, USA, September 2011.

36. *Photon-Photon Interactions via Rydberg Blockade*, International Conference on Quantum Technologies, Russian Quantum Center, Moscow, Russia, July 2011.

35. *Novel Systems and Methods for Quantum Communication, Quantum Computation, and Quantum Simulation*, Meeting of the APS Division of AMO Physics, Atlanta, GA, USA, June 2011.

34. *Photon-Photon Interactions via Rydberg Blockade*, Seminar, Center for Exotic Quantum Systems, California Institute of Technology, Pasadena, CA, USA, May 2011.

33. *Two-Orbital SU(N) Magnetism with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Condensed Matter Seminar, Department of Physics & Astronomy, University of California, Irvine, CA, USA, April 2011.

32. *Two-Orbital SU(N) Magnetism with Ultracold Alkaline-Earth Atoms*, APS March Meeting, Dallas, TX, USA, March 2011.

31. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Seminar, Center for Macroscopic Quantum Control & Department of Physics and Astronomy, Seoul National University, Seoul, Korea, January 2011.

30. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, KITP program Beyond Standard Optical Lattices, Kavli Institute for Theoretical Physics, Santa Barbara, CA, USA, November 2010.

29. *Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, Informal AMO Theory Seminar, JILA, University of Colorado, Boulder, CO, USA, July 2010.

28. *Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, Seminar, College of William & Mary, Williamsburg, VA, USA, June 2010.

27. *Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, NSF site visit, Institute for Theoretical AMO Physics, Harvard University, Cambridge, MA, USA, May 2010.

26. *Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, 10-minute talk, Harvard-MIT Center for Ultracold Atoms, Cambridge, MA, USA, February 2010.

25. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Special Condensed Matter Seminar, KITP, Santa Barbara, CA, USA, January 2010.

24. *Quantum Information Processing and Quantum Simulation with Alkaline-Earth Atoms*, IQI Group Meeting, Institute for Quantum Information, California Institute of Technology, Pasadena, CA, USA, January 2010.

23. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Seminar, Joint Quantum Institute, NIST, and the University of Maryland, Gaithersburg, MD, USA, December 2009.

22. *Optimal Photon Storage in Atomic Ensembles and Photonic Phase Gate via an Exchange of Fermionic Spin Waves in a Spin Chain*, CQuIC Seminar, Physics Department, University of New Mexico, Albuquerque, NM, USA, December 2009.

21. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, CQuIC Seminar, Physics Department, University of New Mexico, Albuquerque, NM, USA, December 2009.

20. *Many-body physics (quantum simulation) with ultracold alkaline-earth atoms*, Guest Lecture in *Physics 284: Strongly Correlated Systems in Atomic and Condensed Matter Physics*, Physics Department, Harvard University, Cambridge, MA, USA, October 2009.

19. *Two-Orbital SU(N) Magnetism with Ultracold Alkaline Earth Atoms*, Wilhelm und Else Heraeus Seminar on Quantum Simulators, Physikzentrum Bad Honnef, Bad Honnef, Germany, October 2009.

18. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Advisory Board Meeting, Institute for Theoretical AMO Physics, Harvard University, Cambridge, MA, USA, October 2009.

17. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, CUA Seminar, Harvard-MIT Center for Ultracold Atoms, Cambridge, MA, USA, September 2009.

16. *Quantum Zeno effect and its application to room-temperature NV-based quantum computing*, Walsworth Group Seminar, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA, September 2009.

15. *Alkaline-Earth Atoms as Few-Qubit Quantum Registers*, Workshop on Ultracold Group II Atoms: Quantum Metrology and Information, Joint Quantum Institute, NIST, and the University of Maryland, College Park, MD, USA, September 2009.

14. *Quantum simulation with ultracold alkaline-earth atoms in optical lattices: two-orbital SU(N) magnetism*, Seminar, Institute for Quantum Optics and Quantum Information, Innsbruck, Austria, June 2009.

13. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Seminar, Max-Planck-Institut für Quantenoptik, Garching, Germany, April 2009.

12. *Quantum Information Processing and Quantum Simulation with Ultracold Alkaline-Earth Atoms in Optical Lattices*, Joint Atomic Physics Colloquium, Institute for Theoretical AMO Physics and Department of Physics, Harvard University, Cambridge, MA, USA, April 2009.

11. *Quantum Information Processing and Two-Orbital SU(N) Magnetism with Alkaline-Earth Atoms in Optical Lattices*, CMT Kids Seminar, Physics Department, Harvard University, Cambridge, MA, USA, March 2009.

10. *Quantum Simulation with Alkaline-Earth Atoms in Optical Lattices: Two-Orbital SU(N) Magnetism*, CMT/AMO Seminar, Physics Department, Harvard University, Cambridge, MA, USA, February 2009.

9. *Suppression of Inelastic Collisions between Polar Molecules with a Repulsive Shield and Alkaline-Earth-Like Atoms as Few-Qubit Quantum Registers*, Walsworth Group Seminar, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA, USA, September 2008.
8. *Repulsive Shield Between Polar Molecules*, 10-minute talk, Harvard-MIT Center for Ultracold Atoms, MIT, Cambridge, MA, USA, May 2008.
7. *"Blue Shield" for Polar Molecules*, Seminar, Physics Department, Harvard University, Cambridge, MA, USA, February 2008.
6. *Coherent Quantum Optical Control with Sub-Wavelength Resolution*, Seminar, Physics Department, Stuttgart University, Stuttgart, Germany, December 2007.
5. *Coherent Quantum Optical Control with Sub-Wavelength Resolution*, Seminar, Institute for Quantum Optics and Quantum Information, Innsbruck, Austria, December 2007.
4. *Optimal Control of Photon Storage in Atomic Ensembles*, Princeton-TAMU Symposium on Quantum Coherence and Laser Spectroscopy, Princeton University, Princeton, NJ, USA, March 2007.
3. *Time Reversal as an Experimental Tool for Optimizing Quantum Light-Matter Interfaces*, 10-minute Talk, Harvard-MIT Center for Ultracold Atoms, Cambridge, MA, USA, February 2007.
2. *Optimal Storage of Photon States in Atomic Ensembles*, Advisory Board Meeting, Institute for Theoretical AMO Physics, Cambridge, MA, USA, May 2006.
1. *Optimal Storage of Photon States in Atomic Ensembles*, Seminar, Niels Bohr Institute, Copenhagen, Denmark, March 2006.