

Publications

Anton Frisk Kockum

Statistics

[Google Scholar](#) (>10,600 citations, h-index 46, i10-index 74)
Web of Science ResearcherID: [E-8255-2014](#) (>6,300 citations, h-index 37)

Journal	Publications	Impact factor (2024)
<i>Nature</i>	1	48.5
<i>Science</i>	1	45.8
<i>Nature Reviews Physics</i>	1	39.5
<i>Nature Photonics</i>	1	32.9
<i>Physics Reports</i>	2	29.5
<i>Nature Physics</i>	1	18.4
<i>Physical Review X</i>	1	15.7
<i>Nature Communications</i>	2	15.7
<i>PRX Quantum</i>	4	11.0
<i>Nano Letters</i>	1	9.1
<i>Physical Review Letters</i>	16	9.0
<i>npj Quantum Information</i>	6	8.3
<i>ACM Transactions on Quantum Computing</i>	1	6.8
<i>Quantum</i>	2	5.4
<i>Quantum Science and Technology</i>	3	5.0
<i>Physical Review Applied</i>	2	4.4
<i>Physical Review Research</i>	8	4.2
<i>Scientific Reports</i>	3	3.9
<i>Applied Physics Letters</i>	1	3.6
<i>Physical Review A</i>	20	2.9
<i>New Journal of Physics</i>	3	2.8
<i>Journal of Physics B</i>	1	1.5

Preprints

The EU Quantum Flagship’s key performance indicators for quantum computing
Zoltán Zimborás, Attila Portik, David Aguirre, Rubén Peña, Domonkos Svastits, András Pályi, Áron Márton, János K. Asbóth, [Anton Frisk Kockum](#), Mikel Sanz, Orsolya Kálmán, Thomas Monz, and Frank K. Wilhelm-Mauch
[arXiv:2512.19653](#)

Crosstalk dispersion and spatial scaling in superconducting qubit arrays
Mohammed Alghadeer, Simon Pettersson Fors, Shuxiang Cao, Simone D. Fasciati, Haru Ishizaka, [Anton Frisk Kockum](#), Peter Leek, and Mustafa Bakr
[arXiv:2512.18148](#)

Realizing on-demand all-to-all selective interactions between distant spin ensembles

Chong-Xin Run, Kuan-Ting Lin, Kai-Min Hsieh, Bang-Yao Wu, Wei-Min Zhou, Guin-Dar Lin, [Anton Frisk Kockum](#), and Io-Chun Hoi

arXiv:[2512.07326](#)

Doublon bound states in the continuum through giant atoms

Walter Rieck, [Anton Frisk Kockum](#), and Guangze Chen

arXiv:[2511.18212](#)

Quantum measurement tomography with mini-batch stochastic gradient descent

Akshay Gaikwad, Manuel Sebastian Torres, and [Anton Frisk Kockum](#)

arXiv:[2511.15682](#)

Generating spatially separated correlated multiphoton states in nonlinear waveguide quantum electrodynamics

Jia-Qi Li, [Anton Frisk Kockum](#), and Xin Wang

arXiv:[2511.14281](#)

Tunable frequency conversion and comb generation with a superconducting artificial atom

Fahad Aziz, Zhengqi Niu, Tzu-Yen Hsieh, Kuan Ting Lin, Yu-Huan Huang, Yen-Hsiang Lin, Ching-Yeh Chen, Yu-Ting Cheng, Kai-Min Hsieh, Jeng-Chung Chen, [Anton Frisk Kockum](#), Guin-Dar Lin, Zhi-Rong Lin, Ping-Yi Wen, and Io-Chun Hoi

arXiv:[2510.26749](#)

Lattice surgery with Bell measurements: Modular fault-tolerant quantum computation at low entanglement cost

Trond Hjerpekjøn Haug, Timo Hillmann, [Anton Frisk Kockum](#), and Raphaël Van Laer

arXiv:[2510.13541](#)

Efficient three-qubit gates with giant atoms

Guangze Chen and [Anton Frisk Kockum](#)

arXiv:[2510.04545](#)

Overhead in quantum circuits with time-multiplexed qubit control

Marvin Richter, Ingrid Strandberg, Simone Gasparinetti, and [Anton Frisk Kockum](#)

arXiv:[2508.20752](#)

Intrinsic multi-mode interference for passive suppression of Purcell decay in superconducting circuits

Mustafa Bakr, Mohammed Alghadeer, Simon Pettersson Fors, Simone D. Fasciati, Shuxiang Cao, Atharv Mahajan, Smain Amari, [Anton Frisk Kockum](#), and Peter Leek

arXiv:[2507.09715](#)

Quantum computing and artificial intelligence: status and perspectives

Giovanni Acampora, Andris Ambainis, Natalia Ares, Leonardo Banchi, Pallavi Bhardwaj, Daniele Binosi, G. Andrew D. Briggs, Tommaso Calarco, Vedran Dunjko, Jens Eisert, Olivier Ezratty, Paul Erker, Federico Fedeale, Elies Gil-Fuster, Martin Gärttner, Mats Granath, Markus Heyl, Iordanis Kerenidis, Matthias Klusch, [Anton Frisk Kockum](#), Richard Kueng, Mario Krenn, Jörg Lässig, Antonio Macaluso, Sabrina Maniscalco, Florian Marquardt, Kristel Michielsen, Gorka Muñoz-Gil, Daniel Müssig, Hendrik Poulsen Nautrup, Evert van Nieuwenburg, Roman Orus, Jörg Schmiedmayer, Markus Schmitt, Philipp Slusallek, Filippo Vicentini, Christof Weitenberg, and Frank K. Wilhelm

arXiv:[2505.23860](#)

Sequential decoding of the XYZ^2 hexagonal stabilizer code

Basudha Srivastava, Yinzi Xiao, [Anton Frisk Kockum](#), Ben Criger, and Mats Granath
arXiv:[2505.03691](#)

Selective and efficient quantum state tomography for multi-qubit systems

Aniket Patel, Akshay Gaikwad, Tangyou Huang, [Anton Frisk Kockum](#), and Tahereh Abad
arXiv:[2503.20979](#)

Scalable quantum simulator with an extended gate set in giant atoms

Guangze Chen and [Anton Frisk Kockum](#)
to appear in *Quantum*
arXiv:[2503.04537](#)

Engineering the environment of a superconducting qubit with an artificial giant atom

Jingjing Hu, Dengfeng Li, Yufan Qie, Zelong Yin, [Anton Frisk Kockum](#), Franco Nori, and Shuoming An
arXiv:[2410.15377](#)

Fast unconditional reset and leakage reduction in fixed-frequency transmon qubits

Liangyu Chen, Simon Pettersson Fors, Zixian Yan, Anaida Ali, Tahereh Abad, Amr Osman, Eleftherios Moschandreou, Benjamin Lienhard, Sandoko Kosen, Hang-Xi Li, Daryoush Shiri, Tong Liu, Stefan Hill, Abdullah-Al Amin, Robert Rehammar, Mamta Dahiya, Andreas Nylander, Marcus Rommel, Anita Fadavi Roudsari, Marco Caputo, Leif Grönberg, Joonas Govenius, Miroslav Dobsicek, Michele Faucci Giannelli, [Anton Frisk Kockum](#), Jonas Bylander, and Giovanna Tancredi
arXiv:[2409.16748](#)

Comprehensive explanation of ZZ coupling in superconducting qubits

Simon Pettersson Fors, Jorge Fernández-Pendás, and [Anton Frisk Kockum](#)
arXiv:[2408.15402](#)

Nonlinear chiral quantum optics with giant-emitter pairs

Xin Wang, Jia-Qi Li, Zhihai Wang, [Anton Frisk Kockum](#), Lei Du, Tao Liu, and Franco Nori
arXiv:[2404.09829](#)

Detecting quantum speedup of random walks with machine learning

Hanna Linn, Yu Zheng, and [Anton Frisk Kockum](#)
arXiv:[2309.02212](#)

Synthesizing electromagnetically induced transparency without a control field in waveguide QED using small and giant atoms

Andreas Ask, Yao-Lung L. Fang, and [Anton Frisk Kockum](#)
arXiv:[2011.15077](#)

Published articles

81. Generative flow-based warm start of the variational quantum eigensolver

Hang Zou, Martin Rahm, [Anton Frisk Kockum](#), and Simon Olsson
npj Quantum Information **12**, 5 (2026)
arXiv:[2507.01726](#)

80. **Quantum process tomography with digital twins of error matrices**
Tangyou Huang, Akshay Gaikwad, Ilya Moskalenko, Anuj Aggarwal, Tahereh Abad, Marko Kuzmanović, Yu-Han Chang, Ognjen Stanisavljević, Emil Hogedal, Christopher Warren, Irshad Ahmad, Janka Biznárová, Amr Osman, Mamta Dahiya, Marcus Rommel, Anita Fadavi Roudsari, Andreas Nylander, Liangyu Chen, Jonas Bylander, Gheorghe Sorin Paraoanu, Anton Frisk Kockum, and Giovanna Tancredi
[*Physical Review Letters* **135**, 230601 \(2025\)](#)
arXiv:2505.07725
79. **Dressed interference in giant superatoms: entanglement generation and transfer**
Lei Du, Xin Wang, Anton Frisk Kockum, and Janine Splettstoesser
[*Physical Review Letters* **135**, 223601 \(2025\)](#)
Featured in the news at phys.org
arXiv:2504.12942
78. **Simulation of quantum computers: review and acceleration opportunities**
Alessio Cicero, Mohammad Ali Maleki, Muhammad Waqar Azhar, Anton Frisk Kockum, and Pedro Trancoso
[*ACM Transactions on Quantum Computing* **7**, 3 \(2025\)](#)
arXiv:2410.12660
77. **Gradient-descent methods for fast quantum state tomography**
Akshay Gaikwad, Manuel Sebastian Torres, Shahnawaz Ahmed, and Anton Frisk Kockum
[*Quantum Science and Technology* **10**, 045055 \(2025\)](#)
arXiv:2503.04526
76. **Group delay controlled by the decoherence of a single artificial atom**
Yu-Ting Cheng, Kai-Min Hsieh, Bang-Yao Wu, Zheng-Qi Niu, Fahad Aziz, Yu-Huan Huang, Ping Yi Wen, Kuan-Ting Lin, Yen-Hsiang Lin, Jeng Chung Chen, Anton Frisk Kockum, Guin-Dar Lin, Zhi-Rong Lin, Yong Lu, and Io-Chun Hoi
[*Physical Review Letters* **135**, 073601 \(2025\)](#)
arXiv:2409.07731
75. **Quantum SWAP gate realized with CZ and iSWAP gates in a superconducting architecture**
Christian Križan, Janka Biznárová, Liangyu Chen, Emil Hogedal, Amr Osman, Christopher W. Warren, Sandoko Kosen, Hang-Xi Li, Tahereh Abad, Anuj Aggarwal, Marco Caputo, Jorge Fernández-Pendás, Akshay Gaikwad, Leif Grönberg, Andreas Nylander, Robert Rehammar, Marcus Rommel, Olga I. Yuzeppovich, Anton Frisk Kockum, Joonas Govenius, Giovanna Tancredi, and Jonas Bylander
[*New Journal of Physics* **27**, 074507 \(2025\)](#)
arXiv:2412.15022
74. **Tunable coherent microwave beam splitter and combiner at the single-photon level**
Yu-Huan Huang, Kai-Min Hsieh, Fahad Aziz, Zheng-Qi Niu, Ping-Yi Wen, Yu-Ting Cheng, Yi-Shin Tsai, Jeng-Chung Chen, Xin Wang, Anton Frisk Kockum, Zhi-Rong Lin, Yen-Hsiang Lin, and Io-Chun Hoi
[*Applied Physics Letters* **127**, 014002 \(2025\)](#)
arXiv:2503.20353
73. **Deterministic generation of frequency-bin-encoded microwave photons**
Jiaying Yang, Maryam Khanahmadi, Ingrid Strandberg, Akshay Gaikwad, Claudia Castillo-Moreno, Anton Frisk Kockum, Muhammad Asad Ullah, Göran Johansson, Axel Martin

- Eriksson, and Simone Gasparinetti
[Physical Review Letters](#) **134**, 240803 (2025)
[arXiv:2410.23202](#)
72. **Entanglement of photonic modes from a continuously driven two-level system**
 Jiaying Yang, Ingrid Strandberg, Alejandro Vivas-Viaña, Akshay Gaikwad, Claudia Castillo-Moreno, [Anton Frisk Kockum](#), Muhammad Asad Ullah, Carlos Sánchez Muñoz, Axel Martin Eriksson, and Simone Gasparinetti
[npj Quantum Information](#) **11**, 69 (2025)
[arXiv:2407.07991](#)
 71. **Impact of decoherence on the fidelity of quantum gates leaving the computational subspace**
 Tahereh Abad, Yoni Schattner, [Anton Frisk Kockum](#), and Göran Johansson
[Quantum](#) **9**, 1684 (2025)
[arXiv:2302.13885](#)
 70. **Nearly quantum-limited microwave amplification via interfering degenerate stimulated emission in a single artificial atom**
 Fahad Aziz, Kuan-Ting Lin, Ping-Yi Wen, Samina, Yu-Chen Lin, Emely Wiegand, Ching-Ping Lee, Yu-Ting Cheng, Yong Lu, Ching-Yeh Chen, Chin-Hsun Chien, Kai-Min Hsieh, Yu-Huan Huang, Haw-Tyng Huang, Hou Ian, Jeng-Chung Chen, Yen-Hsiang Lin, [Anton Frisk Kockum](#), Guin-Dar Lin, and Io-Chun Hoi
[npj Quantum Information](#) **11**, 45 (2025)
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 69. **Unconventional and robust light-matter interactions based on the non-Hermitian skin effect**
 Lei Du and [Anton Frisk Kockum](#)
[Physical Review Research](#) **7**, 013140 (2025)
[arXiv:2408.09826](#)
 68. **Simulating open quantum systems with giant atoms**
 Guangze Chen and [Anton Frisk Kockum](#)
[Quantum Science and Technology](#) **10**, 025028 (2025)
[arXiv:2406.13678](#)
 67. **Entangling Schrödinger’s cat states by bridging discrete- and continuous-variable encoding**
 Daisuke Hoshi, Toshiaki Nagase, Sangil Kwon, Daisuke Iyama, Takahiko Kamiya, Shiori Fujii, Hiroto Mukai, Shahnawaz Ahmed, [Anton Frisk Kockum](#), Shohei Watabe, Fumiki Yoshihara, and Jaw-Shen Tsai
[Nature Communications](#) **16**, 1309 (2025)
[arXiv:2406.17999](#)
 66. **Measuring the quantum state of photoelectrons**
 Hugo Laurell, Sizuo Luo, Robin Weissenbilder, Mattias Ammitzböll, Shahnawaz Ahmed, Hugo Söderberg, C. Leon M. Petersson, Vénus Poulain, Chen Guo, Christoph Dittel, Daniel Finkelstein-Shapiro, Richard J. Squibb, Raimund Feifel, Mathieu Gisselbrecht, Cord L. Arnold, Andreas Buchleitner, Eva Lindroth, [Anton Frisk Kockum](#), Anne L’Huillier, and David Busto
[Nature Photonics](#) **19**, 352 (2025)
[arXiv:2309.13945](#)

65. **Avoiding decoherence with giant atoms in a two-dimensional structured environment**
 Emil Raaholt Ingelsten, [Anton Frisk Kockum](#), and Ariadna Soro
[Physical Review Research](#) **6**, 043222 (2024)
[arXiv:2402.10879](#)
64. **Applying quantum approximate optimization to the heterogeneous vehicle routing problem**
 David Fitzek, Toheed Ghandriz, Leo Laine, Mats Granath, and [Anton Frisk Kockum](#)
[Scientific Reports](#) **14**, 25415 (2024)
[arXiv:2110.06799](#)
63. **Heralding entangled optical photons from a microwave quantum processor**
 Trond Hjerpekjøn Haug, [Anton Frisk Kockum](#), and Raphaël Van Laer
[Physical Review Applied](#) **22**, 034068 (2024)
[arXiv:2308.14173](#)
62. **Signal crosstalk in a flip-chip quantum processor**
 Sandoko Kosen, Hang-Xi Li, Marcus Rommel, Robert Rehammar, Marco Caputo, Leif Grönberg, Jorge Fernández-Pendás, [Anton Frisk Kockum](#), Janka Biznárová, Liangyu Chen, Christian Križan, Andreas Nylander, Amr Osman, Anita Fadavi Roudsari, Daryoush Shiri, Giovanna Tancredi, Joonas Govenius, and Jonas Bylander
[PRX Quantum](#) **5**, 030350 (2024)
 Selected for an accompanying Synopsis in [Physics](#) **17**, s113 (2024)
[arXiv:2403.00285](#)
61. **Extended quantum process tomography of logical operations on an encoded bosonic qubit**
 Mikael Kervinen, Shahnawaz Ahmed, Marina Kudra, Axel Eriksson, Fernando Quijandría, [Anton Frisk Kockum](#), Per Delsing, and Simone Gasparinetti
[Physical Review A](#) **110**, L020401 (2024)
[arXiv:2303.01451](#)
60. **Quantum amplification and simulation of strong and ultrastrong coupling of light and matter**
 Wei Qin, [Anton Frisk Kockum](#), Carlos Sánchez Muñoz, Adam Miranowicz, and Franco Nori
[Physics Reports](#) **1078**, 1–59 (2024)
[arXiv:2401.04949](#)
59. **Tuning atom-field interaction via phase shaping**
 Yu-Ting Cheng, Chin-Hsun Chien, Kai-Min Hsieh, Yu-Huan Huang, Ping Yi Wen, Wei-Ju Lin, Yong Lu, Fahad Aziz, Ching-Ping Lee, Kuan-Ting Lin, Ching-Yeh Chen, Jeng-Chung Chen, Chih-Sung Chuu, [Anton Frisk Kockum](#), Guin-Dar Lin, Yen-Hsiang Lin, and Io-Chun Hoi
[Physical Review A](#) **109**, 023705 (2024)
[arXiv:2305.13750](#)
58. **Giant emitters in a structured bath with non-Hermitian skin effect**
 Lei Du, Lingzhen Guo, Yan Zhang, and [Anton Frisk Kockum](#)
[Physical Review Research](#) **5**, L042040 (2023)
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57. **Unconventional saturation effects at intermediate drive in a lossy cavity coupled to few emitters**

- Therese Karmstrand, Benjamin Rousseaux, [Anton Frisk Kockum](#), Timur Shegai, and Göran Johansson
[Physical Review A](#) **108**, 053706 (2023)
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56. **Mitigation of frequency collisions in superconducting quantum processors**
 Amr Osman, Jorge Fernández-Pendás, Christopher Warren, Sandoko Kosen, Marco Scigliuzzo, [Anton Frisk Kockum](#), Giovanna Tancredi, Anita Fadavi Roudsari, and Jonas Bylander
[Physical Review Research](#) **5**, 043001 (2023)
[arXiv:2303.04663](#)
55. **Gaussian conversion protocol for heralded generation of generalized Gottesman-Kitaev-Preskill states**
 Yu Zheng, Alessandro Ferraro, [Anton Frisk Kockum](#), and Giulia Ferrini
[Physical Review A](#) **108**, 012603 (2023)
[arXiv:2301.10030](#)
54. **Extensive characterization and implementation of a family of efficient three-qubit gates at the coherence limit**
 Christopher W. Warren, Jorge Fernández-Pendás, Shahnawaz Ahmed, Tahereh Abad, Andreas Bengtsson, Janka Biznárová, Kamanasish Debnath, Xiu Gu, Christian Križan, Amr Osman, Anita Fadavi Roudsari, Per Delsing, Göran Johansson, [Anton Frisk Kockum](#), Giovanna Tancredi, and Jonas Bylander
[npj Quantum Information](#) **9**, 44 (2023)
[arXiv:2207.02938](#)
53. **Gradient-descent quantum process tomography by learning Kraus operators**
 Shahnawaz Ahmed, Fernando Quijandría, and [Anton Frisk Kockum](#)
[Physical Review Letters](#) **130**, 150402 (2023)
[arXiv:2208.00812](#)
52. **Transmon qubit readout fidelity at the threshold for quantum error correction without a quantum-limited amplifier**
 Liangyu Chen, Hang-Xi Li, Yong Lu, Christopher W. Warren, Christian J. Križan, Sandoko Kosen, Marcus Rommel, Shahnawaz Ahmed, Amr Osman, Janka Biznárová, Anita Fadavi Roudsari, Benjamin Lienhard, Marco Caputo, Kestutis Grigoras, Leif Grönberg, Joonas Govenius, [Anton Frisk Kockum](#), Per Delsing, Jonas Bylander, and Giovanna Tancredi
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[arXiv:2208.05879](#)
51. **Interaction between giant atoms in a one-dimensional structured environment**
 Ariadna Soro, Carlos Sánchez Muñoz, and [Anton Frisk Kockum](#)
[Physical Review A](#) **107**, 013710 (2023)
 Highlighted by *Physical Review A* as one of their most downloaded papers in 2023
 (8 out of 2132 papers highlighted)
[arXiv:2208.04102](#)
50. **Universal fidelity reduction of quantum operations from weak dissipation**
 Tahereh Abad, Jorge Fernández-Pendás, [Anton Frisk Kockum](#), and Göran Johansson
[Physical Review Letters](#) **129**, 150504 (2022)
[arXiv:2110.15883](#)

49. **Deterministic loading and phase shaping of microwaves onto a single artificial atom**
 Wei-Ju Lin, Yong Lu, Ping-Yi Wen, Yu-Ting Chen, Ching-Ping Lee, Kuan-Ting Lin, Kuan-Hsun Chiang, Ming Che Hsieh, Jeng-Chung Chen, C.-S. Chuu, Franco Nori, [Anton Frisk Kockum](#), Guin-Dar Lin, Per Delsing, and Io-Chun Hoi
[Nano Letters](#) **22**, 8137 (2022)
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48. **Robust preparation of Wigner-negative states with optimized SNAP-displacement sequences**
 Marina Kudra, Mikael Kervinen, Ingrid Strandberg, Shahnawaz Ahmed, Marco Scigliuzzo, Amr Osman, Daniel Pérez Lozano, Mats O. Tholén, Riccardo Borgani, David B. Haviland, Giulia Ferrini, Jonas Bylander, [Anton Frisk Kockum](#), Fernando Quijandría, Per Delsing, and Simone Gasparinetti
[PRX Quantum](#) **3**, 030301 (2022)
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[arXiv:2111.07965](#)
47. **Building blocks of a flip-chip integrated superconducting quantum processor**
 Sandoko Kosen, Hang-Xi Li, Marcus Rommel, Daryoush Shiri, Christopher Warren, Leif Grönberg, Jaakko Salonen, Tahereh Abad, Janka Biznárová, Marco Caputo, Liangyu Chen, Kestutis Grigoras, Göran Johansson, [Anton Frisk Kockum](#), Christian Križan, Daniel Pérez Lozano, Graham J. Norris, Amr Osman, Jorge Fernández-Pendás, Anita Fadavi Roudsari, Slawomir Simbierowicz, Giovanna Tancredi, Andreas Wallraff, Christopher Eichler, Joonas Govenius, and Jonas Bylander
[Quantum Science and Technology](#) **7**, 035018 (2022)
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46. **Giant atoms in a synthetic frequency dimension**
 Lei Du, Yan Zhang, Jin-Hui Wu, [Anton Frisk Kockum](#), and Yong Li
[Physical Review Letters](#) **128**, 223602 (2022)
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45. **The XYZ² hexagonal stabilizer code**
 Basudha Srivastava, [Anton Frisk Kockum](#), and Mats Granath
[Quantum](#) **6**, 698 (2022)
[arXiv:2112.06036](#)
44. **Error-rate-agnostic decoding of topological stabilizer codes**
 Karl Hammar, Alexei Orekhov, Patrik Wallin Hybelius, Anna Katariina Wisakanto, Basudha Srivastava, [Anton Frisk Kockum](#), and Mats Granath
[Physical Review A](#) **105**, 042616 (2022)
[arXiv:2112.01977](#)
43. **Deterministic one-way logic gates on a cloud quantum computer**
 Zhi-Peng Yang, Alakesh Baishya, Huan-Yu Ku, Yu-Ran Zhang, [Anton Frisk Kockum](#), Yueh-Nan Chen, Fu-Li Li, Jaw-Shen Tsai, and Franco Nori
[Physical Review A](#) **105**, 042610 (2022)
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42. **Steady-state heat transport and work with a single artificial atom coupled to a waveguide: emission without external driving**
 Yong Lu, Neill Lambert, [Anton Frisk Kockum](#), Ken Funo, Andreas Bengtsson, Simone Gasparinetti, Franco Nori, and Per Delsing

- PRX Quantum* **3**, 020305 (2022)
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41. **Organic charged polaritons in the ultrastrong coupling regime**
Mao Wang, Suman Mallick, Anton Frisk Kockum, and Karl Börjesson
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 40. **Revealing higher-order light and matter energy exchanges using quantum trajectories in ultrastrong coupling**
Vincenzo Macrì, Fabrizio Minganti, Anton Frisk Kockum, Alessandro Ridolfo, Salvatore Savasta, and Franco Nori
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 39. **Chiral quantum optics with giant atoms**
Ariadna Soro and Anton Frisk Kockum
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 38. **Fast multi-qubit gates through simultaneous two-qubit gates**
Xiu Gu, Jorge Fernández-Pendás, Pontus Vikstål, Tahereh Abad, Christopher Warren, Andreas Bengtsson, Giovanna Tancredi, Vitaly Shumeiko, Jonas Bylander, Göran Johansson, and Anton Frisk Kockum
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 37. **Classification and reconstruction of optical quantum states with deep neural networks**
Shahnawaz Ahmed, Carlos Sánchez Muñoz, Franco Nori, and Anton Frisk Kockum
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 36. **Quantum state tomography with conditional generative adversarial networks**
Shahnawaz Ahmed, Carlos Sánchez Muñoz, Franco Nori, and Anton Frisk Kockum
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 35. **Ultimate quantum limit for amplification: a single atom in front of a mirror**
Emely Wiegand, Ping-Yi Wen, Per Delsing, Io-Chun Hoi, and Anton Frisk Kockum
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 34. **Characterizing decoherence rates of a superconducting qubit by direct microwave scattering**
Yong Lu, Andreas Bengtsson, Jonathan J. Burnett, Emely Wiegand, Baladitya Suri, Philip Krantz, Anita Fadavi Roudsari, Anton Frisk Kockum, Simone Gasparinetti, Göran Johansson, and Per Delsing
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 33. **Engineering the level structure of a giant artificial atom in waveguide quantum electrodynamics**
A. M. Vadiraj, Andreas Ask, Thomas G. McConkey, Ibrahim Nsanzineza, C. W. Sandbo Chang, Anton Frisk Kockum, and C. M. Wilson

- Physical Review A* **103**, 023710 (2021)
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32. **Tunable chiral bound states with giant atoms**
Xin Wang, Tao Liu, Anton Frisk Kockum, Hong-Rong Li, and Franco Nori
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 31. **Oscillating bound states for a giant atom**
Lingzhen Guo, Anton Frisk Kockum, Florian Marquardt, and Göran Johansson
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 30. **Simulating ultrastrong-coupling processes breaking parity conservation in Jaynes–Cummings systems**
Carlos Sánchez Muñoz, Anton Frisk Kockum, Adam Miranowicz, and Franco Nori
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 29. **Improved success probability with greater circuit depth for the quantum approximate optimization algorithm**
Andreas Bengtsson, Pontus Vikstål, Christopher Warren, Marika Svensson, Xiu Gu, Anton Frisk Kockum, Philip Krantz, Christian Krizan, Daryoush Shiri, Ida-Maria Svensson, Giovanna Tancredi, Göran Johansson, Per Delsing, Giulia Ferrini, and Jonas Bylander
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 28. **Waveguide quantum electrodynamics with giant superconducting artificial atoms**
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 27. **Deep Q-learning decoder for depolarizing noise on the toric code**
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 26. **Large collective Lamb shift of two distant superconducting artificial atoms**
Ping Yi Wen*, Kuan-Ting Lin*, Anton Frisk Kockum*, Baladitya Suri, Hou Ian, Jeng-Chung Chen, S. Y. Mao, C. C. Chiu, Per Delsing, Franco Nori, Guin-Dar Lin, and Io-Chun Hoi
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*Equal author contributions
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