Curriculum Vitae of Anton Frisk Kockum

Name	Anton Frisk Kockum
Birth date	June 20th 1987
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Homepage	antonfriskkockum. wixsite.com/research

Education and degrees

Dec 2020	**Docent**, Chalmers University of Technology
Dec 2014	**PhD** in theoretical physics, Chalmers University of Technology Supervisor: Göran Johansson
Oct 2010	**MSc** in Engineering Physics, Chalmers University of Technology

Positions

May 2024 –	**Associate professor**, Chalmers University of Technology
Oct 2022 – May 2024	**Senior researcher**, Chalmers University of Technology
Jun 2020 – Nov 2022	**Scientific coordinator** of the Wallenberg Centre for Quantum Technology (WACQT), Chalmers University of Technology
Aug 2018 – Sep 2022	**Researcher** (permanent position), Chalmers University of Technology
Apr 2015 – Aug 2018	**Postdoctoral researcher**, RIKEN
Jan 2015 – Mar 2015	**Postdoctoral researcher**, Chalmers University of Technology
Nov 2010 – Dec 2014	**PhD student**, Chalmers University of Technology
Sep 2008 – Jun 2010	**Teaching assistant**, Chalmers University of Technology

Publications

70 published papers (27 in high-impact journals), 14 preprints, and 3 book chapters
12 publications as first (or shared first) author, 18 as last author
Google Scholar (>8,900 citations, h-index 42, i10-index 63)
ResearcherID: E-8255-2014 (>5,300 citations, h-index 34)

Presentations

27 invited talks at conferences and workshops
30 contributed talks at conferences and workshops
55 seminars at universities, popular science presentations, etc.
11 poster presentations

Peer review

158 reviews for 33 journals, including *Reviews of Modern Physics*, *Nature*, and *Science*
Grant reviews for the European Research Council, the Swiss National Science Foundation, the Dutch Research Council, the Swedish Research Council, the Israel Science Foundation, the Austrian Science Fund, and Vinnova (the Swedish Innovation Agency)
Web of Science profile APS Outstanding Referee (2025), IOP Trusted Reviewer (2020)

Teaching and examination

Chalmers University of Technology

2020 –	Lecturer, *Quantum Computing* (MSc); Examiner from 2023
2019	Developed and lectured *Advanced Quantum Algorithms* (PhD)
2008 – 2014	Teaching assistant, many undergraduate courses

Have attended courses in pedagogy and received a Diploma of Higher Education (15 ECTS)
Faculty opponent 2 PhD students; grading committee 5 PhD students; examiner 3 PhD students
Examiner 7 MSc theses

Supervision

Current (previous)

2 (3)	postdocs
4 (3)	PhD students as main supervisor, 7 (4) as assistant supervisor
0 (6)	MSc thesis students as main supervisor, 2 (4) as assistant supervisor
1 (4)	BSc thesis projects

Other academic citizenship

2014 –	Member of the organization committee for 9 conferences and workshops
2023 –	Member of the WACQT graduate school committee
2025 –	Swedish representative, Quantum Community Network (Quantum Flagship)
2025 – 2028	Member of the committee for the Lise Meitner award

Selected grants and awards

2025	Wallmarkska priset, Royal Swedish Academy of Sciences
2024	WACQT Fellow (main PI, 12 MSEK)
2022	Quantum Technology Flagship grant, Horizon Europe Programme (co-PI, 20 MEUR)
2022	WASP-WACQT collaboration project (co-PI, 2 MSEK)
2022	Future Research Leaders grant from the Swedish Foundation for Strategic Research [SSF] (main PI, 15 MSEK)
2022	Future Software Systems grant, SSF (co-PI, 35 MSEK)
2022	Honourable mention, Supervisor of the Year, Chalmers
2019	Starting grant, Swedish Research Council (main PI, 3.2 MSEK)
2019	BRIDGE Fellowship, Japan Society for the Promotion of Science (350 kJPY)
2015	Postdoctoral Fellowship, Japan Society for the Promotion of Science (10 MJPY)
2011	The John Ericsson medal (awarded to students with top grades at Chalmers)
2006	Honourable Mention, International Physics Olympiad, Singapore

Publications

Anton Frisk Kockum

Statistics

Google Scholar (>8,900 citations, h-index 42, i10-index 63)
Web of Science ResearcherID: E-8255-2014 (>5,300 citations, h-index 34)

Journal	Publications	Impact factor (2023)
Nature	1	50.5
Nature Reviews Physics	1	44.8
Science	1	44.7
Nature Photonics	1	32.3
Physics Reports	2	23.9
Nature Physics	1	17.6
Nature Communications	2	14.7
Physical Review X	1	11.6
Nano Letters	1	9.6
PRX Quantum	4	9.3
Physical Review Letters	12	8.1
npj Quantum Information	4	6.6
Quantum	1	6.4
Quantum Science and Technology	2	5.6
Physical Review Applied	2	3.8
Scientific Reports	3	3.8
Physical Review Research	8	3.5
New Journal of Physics	2	2.8
Physical Review A	20	2.6
Journal of Physics B	1	1.5

Preprints

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

Tunable coherent microwave beam splitter and combiner at the single-photon level
Yu-Huan Huang, Kai-Min Hsieh, Fahad Aziz, Z. Q. Niu, Ping-Yi Wen, Yu-Ting Cheng, Y.-S. Tsai, Jeng Chung Chen, Xin Wang, Anton Frisk Kockum, Z.-R. Lin, Yen-Hsiang Lin, and Io-Chun Hoi
arXiv:2503.20353

Scalable quantum simulator with an extended gate set in giant atoms
Guangze Chen and Anton Frisk Kockum
arXiv:2503.04537

Gradient-descent methods for fast quantum state tomography
Akshay Gaikwad, Manuel Sebastian Torres, Shahnawaz Ahmed, and Anton Frisk Kockum
arXiv:2503.04526

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. Yuzephovich, Anton Frisk Kockum, Joonas Govenius, Giovanna Tancredi, and Jonas Bylander
arXiv:2412.15022

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
arXiv:2410.23202

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

Simulation of quantum computers: review and acceleration opportunities
Alessio Cicero, Mohammad Ali Maleki, Muhammad Waqar Azhar, Anton Frisk Kockum, and Pedro Trancoso
arXiv:2410.12660

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

Group delay controlled by the decoherence of a single artificial atom
Yu-Ting Cheng, Kai-Min Hsieh, Bang-Yao Wu, Z. Q. Niu, Fahad Aziz, Yu-Huan Huang, Ping Yi Wen, Kuan-Ting Lin, Yen-Hsiang Lin, Jeng Chung Chen, Anton Frisk Kockum, Guin-Dar Lin, Z.-R. Lin, Yong Lu, and Io-Chun Hoi
arXiv:2409.07731

Comprehensive explanation of ZZ coupling in superconducting qubits
Simon Pettersson Fors, Jorge Fernández-Pendás, and Anton Frisk Kockum
arXiv:2408.15402

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

to appear in *npj Quantum Information*
arXiv:2407.07991

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

Impact of decoherence on the fidelity of quantum gates leaving the computational subspace
Tahereh Abad, Yoni Schattner, Anton Frisk Kockum, and Göran Johansson
to appear in *Quantum*
arXiv:2302.13885

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

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)
arXiv:2302.07442

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 (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)
arXiv:2308.16148

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)
arXiv:2110.00595

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
npj Quantum Information **9**, 26 (2023)
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)
arXiv:2012.15084

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)
Selected as an Editors' Suggestion
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)
arXiv:2112.02717

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)
arXiv:2111.05584

45. **The XYZ^2 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)
arXiv:2108.03865

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)
arXiv:2107.12700

41. **Organic charged polaritons in the ultrastrong coupling regime**
Mao Wang, Suman Mallick, Anton Frisk Kockum, and Karl Börjesson
Physical Review Research **4**, 023016 (2022)
arXiv:2108.13901

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
Physical Review A **105**, 023720 (2022)
arXiv:2107.08759

39. **Chiral quantum optics with giant atoms**
Ariadna Soro and Anton Frisk Kockum
Physical Review A **105**, 023712 (2022)
arXiv:2106.11946

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
PRX Quantum **2**, 040348 (2021)
arXiv:2108.11358

37. **Classification and reconstruction of optical quantum states with deep neural networks**
Shahnawaz Ahmed, Carlos Sánchez Muñoz, Franco Nori, and Anton Frisk Kockum
Physical Review Research **3**, 033278 (2021)
arXiv:2012.02185

36. **Quantum state tomography with conditional generative adversarial networks**
Shahnawaz Ahmed, Carlos Sánchez Muñoz, Franco Nori, and Anton Frisk Kockum
Physical Review Letters **127**, 140502 (2021)
arXiv:2008.03240

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
New Journal of Physics **23**, 043048 (2021)
arXiv:2012.09800

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
npj Quantum Information **7**, 35 (2021)
arXiv:1912.02124

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)
arXiv:2003.14167

32. **Tunable chiral bound states with giant atoms**
Xin Wang, Tao Liu, Anton Frisk Kockum, Hong-Rong Li, and Franco Nori
Physical Review Letters **126**, 043602 (2021)
arXiv:2008.13560

31. **Oscillating bound states for a giant atom**
Lingzhen Guo, Anton Frisk Kockum, Florian Marquardt, and Göran Johansson
Physical Review Research **2**, 043014 (2020)
arXiv:1911.13028

30. **Simulating ultrastrong-coupling processes breaking parity conservation in Jaynes–Cummings systems**
Carlos Sánchez Muñoz, Anton Frisk Kockum, Adam Miranowicz, and Franco Nori
Physical Review A **102**, 033716 (2020)
arXiv:1910.12875

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 Križan, Daryoush Shiri, Ida-Maria Svensson, Giovanna Tancredi, Göran Johansson, Per Delsing, Giulia Ferrini, and Jonas Bylander
Physical Review Applied **14**, 034010 (2020)
arXiv:1912.10495

28. **Waveguide quantum electrodynamics with giant superconducting artificial atoms**
Bharath Kannan, Max J. Ruckriegel, Daniel L. Campbell, Anton Frisk Kockum, Jochen Braumüller, David K. Kim, Morten Kjaergaard, Philip Krantz, Alexander Melville, Bethany M. Niedzielski, Antti Vepsäläinen, Roni Winik, Jonilyn L. Yoder, Franco Nori, Terry P. Orlando, Simon Gustavsson, and William D. Oliver
Nature **583**, 775 (2020)
arXiv:1912.12233

27. **Deep Q-learning decoder for depolarizing noise on the toric code**
David Fitzek, Mattias Eliasson, Anton Frisk Kockum, and Mats Granath
Physical Review Research **2**, 023230 (2020)
arXiv:1912.12919

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

Physical Review Letters **123**, 233602 (2019)
arXiv:1904.12473
*Equal author contributions

25. **Interaction of mechanical oscillators mediated by the exchange of virtual photon pairs**
Omar Di Stefano, Alessio Settineri, Vincenzo Macrì, Alessandro Ridolfo, Roberto Stassi, Anton Frisk Kockum, Salvatore Savasta, and Franco Nori
Physical Review Letters **122**, 030402 (2019)
arXiv:1712.00121

24. **Ultrastrong coupling between light and matter**
Anton Frisk Kockum, Adam Miranowicz, Simone De Liberato, Salvatore Savasta, and Franco Nori
Nature Reviews Physics **1**, 19 (2019)
arXiv:1807.11636

23. **Simple preparation of Bell and Greenberger-Horne-Zeilinger states using ultrastrong-coupling circuit QED**
Vincenzo Macrì, Franco Nori, and Anton Frisk Kockum
Physical Review A **98**, 062327 (2018)
arXiv:1810.09808

22. **Photodetection probability in quantum systems with arbitrarily strong light-matter interaction**
Omar Di Stefano, Anton Frisk Kockum, Alessandro Ridolfo, Salvatore Savasta, and Franco Nori
Scientific Reports **8**, 17825 (2018)
arXiv:1711.10698

21. **Dissipation and thermal noise in hybrid quantum systems in the ultrastrong coupling regime**
Alessio Settineri, Vincenzo Macrì, Alessandro Ridolfo, Omar Di Stefano, Anton Frisk Kockum, Franco Nori, and Salvatore Savasta
Physical Review A **98**, 053834 (2018)
arXiv:1807.06348

20. **Decoherence-free interaction between giant atoms in waveguide quantum electrodynamics**
Anton Frisk Kockum, Göran Johansson, and Franco Nori
Physical Review Letters **120**, 140404 (2018)
arXiv:1711.08863

19. **Nonperturbative dynamical Casimir effect in optomechanical systems: vacuum Casimir–Rabi splittings**
Vincenzo Macrì, Alessandro Ridolfo, Omar Di Stefano, Anton Frisk Kockum, Franco Nori, and Salvatore Savasta
Physical Review X **8**, 011031 (2018)
arXiv:1706.04134

18. **Reflective amplification without population inversion from a strongly driven superconducting qubit**
Ping Yi Wen, Anton Frisk Kockum, Hou Ian, Jeng-Chung Chen, Franco Nori, and Io-Chun Hoi

Physical Review Letters **120**, 063603 (2018)
arXiv:1707.06400

17. **Microwave photonics with superconducting quantum circuits**
Xiu Gu*, Anton Frisk Kockum*, Adam Miranowicz, Yu-xi Liu, and Franco Nori
Physics Reports **718–719**, 1–102 (2017)
arXiv:1707.02046
*Equal author contributions

16. **Circuit quantum acoustodynamics with surface acoustic waves**
Riccardo Manenti, Anton Frisk Kockum, Andrew Patterson, Tanja Behrle, Joseph Rahamim, Giovanna Tancredi, Franco Nori, and Peter J. Leek
Nature Communications **8**, 975 (2017)
arXiv:1703.04495

15. **Quantum nonlinear optics without photons**
Roberto Stassi, Vincenzo Macrì, Anton Frisk Kockum, Omar Di Stefano, Adam Miranowicz, Salvatore Savasta, and Franco Nori
Physical Review A **96**, 023818 (2017)
arXiv:1702.00660

14. **Frequency conversion in ultrastrong cavity QED**
Anton Frisk Kockum, Vincenzo Macrì, Luigi Garziano, Salvatore Savasta, and Franco Nori
Scientific Reports **7**, 5313 (2017)
arXiv:1701.07973

13. **Deterministic quantum nonlinear optics with single atoms and virtual photons**
Anton Frisk Kockum, Adam Miranowicz, Vincenzo Macrì, Salvatore Savasta, and Franco Nori
Physical Review A **95**, 063849 (2017)
arXiv:1701.05038

12. **Feynman-diagrams approach to the quantum Rabi model for ultrastrong cavity QED: stimulated emission and reabsorption of virtual particles dressing a physical excitation**
Omar Di Stefano, Roberto Stassi, Luigi Garziano, Anton Frisk Kockum, Salvatore Savasta, and Franco Nori
New Journal of Physics **19**, 053010 (2017)
Selected as a Highlight of 2017
arXiv:1603.04984

11. **Giant acoustic atom: A single quantum system with a deterministic time delay**
Lingzhen Guo, Arne L. Grimsmo, Anton Frisk Kockum, Mikhail Pletyukhov, and Göran Johansson
Physical Review A **95**, 053821 (2017)
Selected as an Editors' Suggestion
arXiv:1612.00865

10. **Leggett–Garg inequality violations with a large ensemble of qubits**
Neill Lambert, Kamanasish Debnath, Anton Frisk Kockum, George C. Knee, William J. Munro, and Franco Nori
Physical Review A **94**, 012105 (2016)
arXiv:1604.04059

9. **Multiphoton quantum Rabi oscillations in ultrastrong cavity QED**
Luigi Garziano, Roberto Stassi, Vincenzo Macrì, Anton Frisk Kockum, Salvatore Savasta, and Franco Nori
Physical Review A **92**, 063830 (2015)
arXiv:1509.06102

8. **Probing the quantum vacuum with an artificial atom in front of a mirror**
Io-Chun Hoi, Anton Frisk Kockum, Lars Tornberg, Arsalan Pourkabirian, Göran Johansson, Per Delsing, and C. M. Wilson
Nature Physics **11**, 1045 (2015)
arXiv:1410.8840

7. **Propagating phonons coupled to an artificial atom**
Martin V. Gustafsson, Thomas Aref, Anton Frisk Kockum, Maria K. Ekström, Göran Johansson, and Per Delsing
Science **346**, 207 (2014)
Selected for an accompanying Perspective
arXiv:1404.0401

6. **Designing frequency-dependent relaxation rates and Lamb shifts for a giant artificial atom**
Anton Frisk Kockum, Per Delsing, and Göran Johansson
Physical Review A **90**, 013837 (2014)
arXiv:1406.0350

5. **Quantum nondemolition detection of a propagating microwave photon**
Sankar R. Sathyamoorthy, Lars Tornberg, Anton Frisk Kockum, Ben Q. Baragiola, Joshua Combes, C. M. Wilson, Thomas M. Stace, and Göran Johansson
Physical Review Letters **112**, 093601 (2014)
arXiv:1308.2208

4. **Detailed modelling of the susceptibility of a thermally populated, strongly driven circuit-QED system**
Anton Frisk Kockum*, Martin Sandberg*, Michael R. Vissers, Jiansong Gao, Göran Johansson, and David P. Pappas
Journal of Physics B: Atomic, Molecular and Optical Physics **46**, 224014 (2013)
Selected for an accompanying Lab Talk
*Equal author contributions

3. **Giant cross-Kerr effect for propagating microwaves induced by an artificial atom**
Io-Chun Hoi, Anton Frisk Kockum, Tauno Palomaki, Thomas M. Stace, Bixuan Fan, Lars Tornberg, Sankar R. Sathyamoorthy, Göran Johansson, Per Delsing, and C. M. Wilson
Physical Review Letters **111**, 053601 (2013)
arXiv:1207.1203

2. **Breakdown of the cross-Kerr scheme for photon counting**
Bixuan Fan, Anton Frisk Kockum, Joshua Combes, Göran Johansson, Io-Chun Hoi, C. M. Wilson, Per Delsing, G. J. Milburn, and Thomas M. Stace
Physical Review Letters **110**, 053601 (2013)
arXiv:1210.0991

1. **Undoing measurement-induced dephasing in circuit QED**
Anton Frisk Kockum, Lars Tornberg, and Göran Johansson

Physical Review A **85**, 052318 (2012)
arXiv:1202.2386

Book chapters

3. **Quantum optics with giant atoms — the first five years**
Anton Frisk Kockum
in *International Symposium on Mathematics, Quantum Theory, and Cryptography (Mathematics for Industry, vol 33)*, edited by Tsuyoshi Takagi, Masato Wakayama, Keisuke Tanaka, Noboru Kunihiro, Kazufumi Kimoto, and Yasuhiko Ikematsu (Springer International Publishing, 2021)
arXiv:1912.13012

2. **Quantum bits with Josephson junctions**
Anton Frisk Kockum and Franco Nori
in *Fundamentals and frontiers of the Josephson effect*, edited by Francesco Tafuri (Springer International Publishing, 2019)
arXiv:1908.09558

1. **Quantum acoustics with surface acoustic waves**
Thomas Aref, Per Delsing, Maria K. Ekström, Anton Frisk Kockum, Martin V. Gustafsson, Göran Johansson, Peter J. Leek, Einar Magnusson, and Riccardo Manenti
in *Superconducting devices in quantum optics*, edited by Robert H. Hadfield and Göran Johansson (Springer International Publishing, 2016)
arXiv:1506.01631

Other publications

3. **Lecture notes on quantum computing**
Anton Frisk Kockum, Ariadna Soro, Laura García-Álvarez, Pontus Vikstål, Tom Douce, Göran Johansson, and Giulia Ferrini
arXiv:2311.08445

2. **Artificial atoms go chiral**
Anton Frisk Kockum
Physics **16**, 103 (2023)
Viewpoint on *Physical Review X* **13**, 021039 (2023)

1. **Electrical control of quantum acoustics**
Anton Frisk Kockum
Nature Electronics **5**, 325 (2022)
News & Views for *Nature Electronics* **5**, 348 (2022)

Theses

Quantum optics with artificial atoms
Anton Frisk Kockum
PhD thesis (Chalmers University of Technology, Gothenburg, 2014)

Measurement back-action and photon detection in microwave quantum optics
Anton Frisk Kockum
Licenciate thesis (Chalmers University of Technology, Gothenburg, 2012)

Modelling spectroscopy on transmon qubits in an undercoupled resonator
Anton Frisk Kockum
MSc thesis (Chalmers University of Technology, Gothenburg, 2010)

Cold-electron bolometers with thin absorbers and improved SIN and SIS' junctions for the BOOMERanG balloon project
Hannes Kuusisto, Anna Karlsson, Oskar Lindgren, Anton Frisk Kockum, and Daniel Midtvedt
BSc thesis (Chalmers University of Technology, Gothenburg, 2009)

Grants

Anton Frisk Kockum

Main applicant

5. **WACQT Fellow, Knut and Alice Wallenberg foundation (KAW) through the Wallenberg Centre for Quantum Technology (WACQT)**
   12,000,000 SEK, 2024–2028

4. **Future Research Leaders, Swedish Foundation for Strategic Research (SSF)**
   Quantum simulation and communication with giant atoms
   15,000,000 SEK, 2023–2027

3. **Starting grant, Swedish Research Council**
   Giant atoms – a new regime in quantum optics
   3,200,000 SEK, 2020–2023

2. **BRIDGE Fellowship, Japan Society for the Promotion of Science**
   350,000 JPY, 2020

1. **JSPS Postdoctoral Fellowship for Overseas Researchers, Japan Society for the Promotion of Science**
   New regimes of quantum optics in giant artificial atoms and hybrid systems
   10,000,000 JPY, 2015–2017

Co-applicant

5. **Project grant for collaboration between WASP (Wallenberg AI, Autonomous Systems and Software Program) and WACQT (Wallenberg Centre for Quantum Technology)**
   Machine-learned control of near-term intermediate-scale quantum devices for applications in chemistry
   2,000,000 SEK, 2023–2025

4. **Quantum Technology Flagship grant, HORIZON-CL4-2022-QUANTUM-01-SGA, Horizon Europe Programme**
   Open Superconducting Quantum Computers (OpenSuperQPlus100)
   20,000,000 EUR, 2023–2026

3. **FuSS – Future Software Systems, Swedish Foundation for Strategic Research (SSF)**
   QuantumStack – Programming the Quantum Computer
   35,000,000 SEK, 2022–2027

2. **Organization of a 3-week program at Nordita (Nordic Institute for Theoretical Physics)**
   Machine learning for Quantum Control and Quantum Computing
   410,000 SEK, 2022

1. **International Cooperation Add-on Project, Ministry of Science and Technology, Taiwan**
   Population inversion with an artificial atom in front of a mirror
   500,000 TWD, 2018–2021

Supervision

Anton Frisk Kockum

Statistics

18 PhD students (7 as main supervisor, 11 as assistant supervisor)
12 MSc thesis students (6 as main supervisor, 6 as assistant supervisor)
5 BSc theses
2 summer interns

PhD students, main supervisor

Marvin Richter
February 2023 –

Alberto del Ángel Medina
January 2023 –

Simon Pettersson Fors
March 2022 –

Ariadna Soro Álvarez
August 2020 –
Licentiate April 2023

David Fitzek
August 2019 – October 2024
"Optimizing the quantum stack: a machine learning approach"
Licentiate May 2022
Industrial PhD student with Volvo Group

Yu Zheng
October 2018 – September 2023
"Making and identifying quantum resources"
Licentiate January 2021

Shahnawaz Ahmed
October 2018 – September 2023
"Machine learning for quantum information and computing"
Licentiate March 2021

PhD students, assistant supervisor

Hang Zou
December 2024 –
Main supervisor: Simon Olsson

Pritwish Agarwal
October 2024 –
Main supervisor: Nils Johan Engelsen

Moritz Lange
June 2024 –
Main supervisor: Mats Granath

Erika Magnusson
September 2023 –
Main supervisor: Martin Rahm

Alessio Cicero
June 2023 –
Main supervisor: Pedro Trancoso

Trond Hjerpekjøn Haug
August 2022 –
Main supervisor: Raphaël Van Laer

Claudia Castillo-Moreno
September 2020 –
Main supervisor: Simone Gasparinetti

Basudha Srivastava
September 2020 – December 2024
"High-threshold error-correcting codes for biased noise with advanced decoding strategies"
Licentiate June 2022
Main supervisor: Mats Granath

Therese Karmstrand
September 2019 – June 2024
"Identical emitters of light in open quantum systems"
Licentiate October 2021
Main supervisor: Göran Johansson

Emely Wiegand
March 2016 – May 2021
"Quantum optics and waveguide quantum electrodynamics in superconducting circuits"
Licentiate September 2019
Main supervisor: Göran Johansson

Andreas Ask
December 2015 – March 2021
"Quantum electro- and acoustodynamics in waveguides"
Licentiate March 2019
Main supervisor: Göran Johansson

MSc thesis students, main supervisor

Manuel Sebastian Torres Hernandez
September 2023 – August 2024
"Gradient descent for quantum state tomography"

Emil Ingelsten
January 2023 – June 2023
"Quantum optics with giant atoms in 2D structured environments"

Simon Pettersson Fors
April 2021 – March 2022
"The static ZZ coupling in superconducting qubits"

Yasir Al-Latifi
September 2020 – March 2021
"Optimizing numerical modelling of quantum computing hardware"

Hanna Linn
March 2020 – October 2020
"Detecting quantum speedup for random walks with artificial neural networks"

Sieglinde Bogaert
September 2019 – June 2020
"Quantum capsule neural networks"
Winner of the KU Leuven master thesis award from Imec

MSc thesis students, assistant supervisor

Pontus Lindgren
2025
Main supervisor: Tahereh Abad

Sumukh Suresh Moudghalya
2025
Main supervisor: Akshay Gaikwad

Alexander Andersson, Sebastian Holmin
2021
"Simulating quantum error correction in a small stabilizer code"
Main supervisor: Mats Granath

Kamanasish Debnath
2015
"Leggett–Garg inequality violations with a large ensemble of qubits"
Main supervisor: Neill Lambert

Sankar Raman Sathyamoorthy
2012
"Quantum non-demolition detection of propagating microwave photons"
Main supervisor: Göran Johansson

BSc thesis students

Julius Andersson, Ghadir Radhi, Axel Sahlstedt Zachrisson, William Weeks
January 2025 – May 2025
"Investigating the effects of thermal noise in superconducting qubits to optimise coherence in quantum computers"

Axel Blom, Albin Edenmyr, Edvin Martinson, Ludvig Nordqvist, Didrik Palmqvist, Isak Wikman
January 2022 – May 2022
"Simulering av störningar på kvantalgoritmer med QuTiP"

Martin Jirlow, Rasmus Hagman, Ella Larsson
January 2022 – May 2022
"Optimal kontroll av enkvantbitsgrindar för supraledande kvantbitar"

Erik Broback, Victor Henkow, Oscar Liljenzin, Andreas Lund, Alex Maltesson, Emil Zaya
January 2022 – May 2022
"Maskininlärning på en kvantdator"

Emil Ingelsten, Linus Nordqvist, Jesper Ozolins, Alexander Reusch Eide, Elina Sahlberg, Henrik Zander
January 2021 – May 2021
"Optimering av tvåkvantbitsgrindar på en supraledande kvantdator"

Summer interns

Linus von Ekensteen Löfgren
June 2023 – August 2023
Linus added a testing module to our in-house software (CSQR: Chalmers Superconducting Qubit Repository) for detailed simulations of superconducting qubits. He also improved the software in several ways.

K. S. Sreekara Sabarish
May 2019 – July 2019
Sreekara studied interaction between multiple modes in a surface-acoustic-wave cavity, mediated by a superconducting qubit whose transition frequency was modulated.

Teaching

Anton Frisk Kockum

Lecturer

2. **Quantum computing**
   Advanced level, 7.5 higher education credits
   Chalmers University of Technology, 2020, 2021, 2022, 2023, 2024
   Examiner 2023, 2024

1. **Advanced Quantum Algorithms**
   PhD level, 7.5 higher education credits
   Chalmers University of Technology, 2019

Teaching assistant

10. **Matematisk analys i en variabel (TMV151)**
    Basic level (1st year), 7.5 higher education credits
    Chalmers University of Technology, 2011, 2012, 2013

9. **Inledande matematik M (TMV225)**
   Basic level (1st year), 7.5 higher education credits
   Chalmers University of Technology, 2011, 2012, 2013

8. **Quantum Informatics (FKA172)**
   Advanced level, 7.5 higher education credits
   Chalmers University of Technology, 2011

7. **Erasmus Mundus Lecture Series**
   Advanced level
   Chalmers University of Technology, 2011

6. **Linjär algebra och numerisk analys F1 (TMA671)**
   Basic level (1st year), 7.5 higher education credits
   Chalmers University of Technology, 2010

5. **Matematisk analys, fortsättning F (TMA976)**
   Basic level (1st year), 6.0 higher education credits
   Chalmers University of Technology, 2009

4. **Inledande matematisk analys F (TMA970)**
   Basic level (1st year), 6.0 higher education credits
   Chalmers University of Technology, 2009

3. **Matematisk analys i flera variabler M (MVE255)**
   Basic level (1st year), 7.5 higher education credits
   Chalmers University of Technology, 2009

2. **Linjär algebra M och TD (TMV166/186)**
   Basic level (1st year), 7.5 higher education credits
   Chalmers University of Technology, 2009

1. **Linjär algebra och geometri F & TM (TMA660)**
   Basic level (1st year), 4.5 higher education credits
   Chalmers University of Technology, 2008

Examiner

Anton Frisk Kockum

Statistics

Faculty opponent for 2 PhD students
Member of the grading committee for 5 PhD students
Examiner for 3 PhD students
Examiner for 8 MSc thesis students (7 MSc theses)
Examiner for 1 course at the advanced (MSc) level

PhD students, faculty opponent

Svend Krøjer Møller
January 2024
Controlling and protecting coherent quantum states
Main supervisor: Karsten Flensberg
Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark

Kasper Sangild Christensen
May 2023
Designing superconducting circuits for quantum computation
Main supervisor: Nikolaj Thomas Zinner
Aarhus University, Aarhus, Denmark

PhD students, member of the grading committee

Jingjun Zhu
April 2025
High-fidelity elementary operations for superconducting quantum computers
Main supervisor: Stéphane Guérin
University of Burgundy, Dijon, France

Eric Hyyppä
October 2024
High-fidelity elementary operations for superconducting quantum computers
Main supervisor: Mikko Möttönen
Aalto University, Espoo, Finland

Timo Gahlmann
December 2023
Machine learning for the free-form inverse design of metamaterials
Main supervisor: Philippe Tassin
Chalmers University of Technology, Gothenburg, Sweden

Hafsa Syed
December 2022
Nuclear spin interactions and coherent control in rare-earth-ion-doped crystals for quantum computing

Main supervisor: Stefan Kröll
Lund University, Lund, Sweden

Pil Maria Saugmann
September 2022
A quantum for a quantum – Quantum simulators in exotic lattices
Main supervisor: Jonas Larson
Stockholm University, Stockholm, Sweden

PhD students, examiner

Albert Lund
Industrial PhD student with Jeppesen
August 2024 –
Main supervisor: Laura García Álvarez
Chalmers University of Technology, Gothenburg, Sweden

Rui Wang
August 2024 –
Main supervisor: Giulia Ferrini
Chalmers University of Technology, Gothenburg, Sweden

Alex Maltesson
August 2024 –
Main supervisor: Giulia Ferrini
Chalmers University of Technology, Gothenburg, Sweden

MSc theses

Walter Rieck
2025
Supervisors: Guangze Chen, Ariadna Soro
Chalmers University of Technology

Pontus Lindgren
2025
Supervisors: Tahereh Abad, Anton Frisk Kockum
Chalmers University of Technology

Sumukh Suresh Moudghalya
2025
Supervisors: Akshay Gaikwad, Anton Frisk Kockum
Chalmers University of Technology

Manuel Sebastian Torres Hernandez
August 2024
Quantum state tomography with gradient descent
Supervisor: Anton Frisk Kockum
Chalmers University of Technology, KU Leuven

Emil Ingelsten
June 2023
Quantum optics with giant atoms in 2D environments
Supervisors: Ariadna Soro, Anton Frisk Kockum
Chalmers University of Technology

Yannick Samson
June 2022
Three-Qubit Gates with Superconducting Flux-Tunable Qubits
Supervisor: Pontus Vikstål
Chalmers University of Technology

David Larsson and Julia Szulc
June 2021
Machine learning control of a quantum computer implementing the variational quantum eigensolver
Supervisors: Simon Olsson, Morten Kjaergaard
Chalmers University of Technology

Sieglinde Bogaert
June 2020
Quantum Capsule Neural Networks
Supervisors: Anton Frisk Kockum, Shahnawaz Ahmed, Kristiaan De Greve, Bram Verhoef
Chalmers University of Technology, KU Leuven

Courses at advanced (MSc) level

Quantum computing
2023, 2024
7.5 higher education credits
Chalmers University of Technology (and RWTH Aachen online)

List of presentations

Anton Frisk Kockum

Statistics

27 Invited talks at conferences and workshops
30 Contributed talks at conferences and workshops
55 Seminars at universities, popular science presentations, etc.
11 Poster presentations

Invited talks at conferences and workshops

27. **Quantum state and process tomography with machine learning and gradient descent**
    2nd Workshop of Machine Learning for Quantum Technology, Erlangen, Germany, November 5–8th 2024

26. **Kvantdatorer, säkerhet och maskininlärning**
    Keynote, Sunetdagarna (online), Sweden, November 4–8th 2024

25. **Giant atoms with superconducting qubits**
    CIMTEC 2024 — Materials in an Explosively Growing Informatics World, Montecatini Terme, Italy, June 20–24th 2024

24. **Architecture considerations for superconducting quantum processors**
    Recent Advances in Quantum Computing and Technology (ReAQCT), Budapest, Hungary, June 19–20th 2024

23. **Quantum state and process tomography with machine learning and gradient descent**
    Quantum Physics and Machine Learning, Obergurgl, Austria, March 25–31st 2024

22. **Designing quantum gates for superconducting qubits with tunable couplers**
    APS March meeting, Minneapolis, USA, March 4–8th 2024

21. **The Wallenberg Centre for Quantum Technology**
    Business Finland project workshop (online), Oulu, Finland, January 18th 2024

20. **Quantum states, qubits, logic gates, and algorithms**
    EuroCC National Competence Centre Sweden (ENCCS) Quantum Autumn School, Gothenburg, Sweden, October 25–27th 2023

19. **Giant atoms and chirality**
    1st Workshop on Quantum Optics with Giant Atomic Emitters, Zürich, Switzerland, September 6-8th 2023

18. **Learning quantum states and processes**
    Excellence Initiative Nano – Community Building Activity, Grebbestad, Sweden, August 21–23rd 2023

17. **Giant atoms — a new frontier in quantum optics**
    BalCon TP 2023 – Dynamical and Hidden Orders, Stockholm, Sweden, June 7–10th 2023

16. **Quantum state and process tomography with machine learning and gradient descent**
    52nd Winter Colloquium on the Physics of Quantum Electronics, Snowbird, Utah, USA, January 9–13th 2023

15. **Quantum states, qubits, logic gates, and algorithms**
    Introduction to Quantum Computing & Hybrid HPC-QC Systems, EuroCC National Competence Centre Sweden (ENCCS) workshop (online), Sweden, June 8–9th 2022

14. **Teaching quantum computing in hybrid formats**
    ENHANCE Staff Week, Chalmers University of Technology, Gothenburg, Sweden, April 26–28th 2022

13. **Chiral quantum optics with giant atoms**
    10th International Workshop on Solid-State Quantum Computing (online), Hong Kong, China, November 29th – December 1st 2021

12. **An overview of WACQT**
    Building a trusted community for quantum technology, Delft, Netherlands, November 1–2nd 2021

11. **Vehicle routing on a quantum computer**
    WACQT Industrial Workshop (online), Sweden, October 21st 2021

10. **Oscillating and chiral bound states in giant atoms**
    2nd International Workshop on Waveguide QED (WQED20, online), Italy, June 21–25th 2021

9. **Quantum state tomography with conditional generative adversarial networks**
    Photonics North (online), Canada, May 31st – June 2nd, 2021

8. **Breaking conservation of excitation number with ultrastrong coupling and how to simulate it**
    Workshop on Prospects of Ultrastrong Light-Matter Interactions, Hindås, Sweden, September 7–9th, 2020

7. **Quantum technology in Sweden**
    NanoForum Summit, Uppsala, Sweden, November 12th, 2019

6. **Large collective Lamb shift of two qubits in front of a mirror**
    International Workshop on Solid-State Quantum Information and Quantum Computing, Shangrao Normal University, Shangrao, China, November 1–4th, 2019

5. **Quantum optics with giant atoms — the first five years**
    International Symposium on Mathematics, Quantum Theory, and Cryptography, Kyushu University, Fukuoka, Japan, September 25–27th, 2019

4. **Simple preparation of Bell and GHZ states using ultrastrong-coupling circuit QED**
    International Workshop on Strongly Coupled Light-Matter Interactions: Models and Applications, Zhejiang University, Hangzhou, China, April 27–28th 2019

3. **Decoherence-free interaction between giant atoms in waveguide QED**
    1st International Workshop on Waveguide QED, Mazara del Vallo, Italy, June 4–8th 2018

2. **Decoherence-free interaction between giant atoms in waveguide QED**
   9th International Workshop on Solid-State Quantum Computing, Hangzhou, China, May 26–28th 2018

1. **Deterministic quantum nonlinear optics with single atoms and virtual photons**
   Workshop on Virtual photons in ultrastrongly coupled systems, RIKEN, Wako, Japan, January 23–26th 2017

Contributed talks at conferences and workshops

30. **Quantum simulation of open quantum many-body systems with giant atoms**
    APS Global Physics Summit, Anaheim, USA, March 16–21st 2025

29. **Fast parametric two-qubit gates for fixed-frequency qubits and tunable couplers, part 1: theory**
    APS Global Physics Summit, Anaheim, USA, March 16–21st 2025

28. **Evaluating architectures for superconducting quantum processors using crosstalk and frequency-variation data**
    Assessing Performance of Quantum Computers (APQC), Estes Park, Colorado, USA, October 7-10th 2024

27. **Simulating open quantum systems with giant atoms**
    55th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics, Fort Worth, USA, June 3–7th 2024

26. **Quantum state and process tomography with machine learning and gradient descent**
    Assessing Performance of Quantum Computers (APQC), Estes Park, Colorado, USA, October 2-5th 2023

25. **Generating families of three-qubit gates from simultaneous two-qubit gates**
    LT29, Sapporo, Japan, August 18–24th 2022

24. **Generating families of three-qubit gates from simultaneous two-qubit gates, part 1: theory**
    APS March meeting, Chicago, USA, March 14–18th 2022

23. **High-threshold stabilizer code on the honeycomb lattice**
    APS March meeting, Chicago, USA, March 14–18th 2022

22. **Deep neural networks for quantum state characterization, part 1: classification**
    APS March meeting (online), USA, March 15–19th 2021

21. **Ultimate quantum limit for amplification: a single atom in front of a mirror**
    APS March meeting (online), USA, March 15–19th 2021

20. **Oscillating bound states for a giant atom**
    APS virtual DAMOP meeting, June 1–5th 2020

19. **Simple preparation of Bell and GHZ states using ultrastrong-coupling circuit QED**
    APS March meeting, Boston, USA, March 4–8th 2019

18. **Decoherence-free interaction between giant atoms in waveguide QED**
International Conference on Challenges in Quantum Information Science, National Institute for Informatics, Tokyo, Japan, April 9–11th 2018

17. **Decoherence-free interaction between giant atoms in waveguide QED**
APS March meeting, Los Angeles, USA, March 5–9th 2018

16. **Nonperturbative dynamical Casimir effect in optomechanical systems: vacuum Casimir-Rabi splittings**
APS March meeting, Los Angeles, USA, March 5–9th 2018

15. **The fully quantized dynamical Casimir effect — vacuum Casimir-Rabi oscillations in optomechanical systems**
International School and Symposium on Nanoscale Transport and phoTonics, NTT, Atsugi, Japan, November 14–17th 2017

14. **Exploring new regimes of quantum optics: giant atoms and ultrastrong coupling**
RIKEN NCHU Workshop, Wako, Japan, September 25th 2017

13. **Deterministic quantum nonlinear optics with single atoms and virtual photons**
28th International Conference on Low Temperature Physics, Gothenburg, Sweden, August 9–16th 2017

12. **Quantum nonlinear optics without real photons**
APS March meeting, New Orleans, USA, March 13–17th 2017

11. **Deterministic quantum nonlinear optics with single atoms and virtual photons**
APS March meeting, New Orleans, USA, March 13–17th 2017

10. **Quantum optics with giant artificial atoms in a 1D waveguide**
APS March meeting, New Orleans, USA, March 13–17th 2017

9. **Deterministic quantum nonlinear optics with single atoms and virtual photons**
International Workshop on Quantum Device, National Institute for Informatics, Tokyo, Japan, March 6–8th 2017

8. **Breaking excitation-number conservation with ultrastrong coupling**
International Workshop on Ultra-Strong Light-Matter Interactions, Bilbao, Spain, September 19–21st 2016

7. **Giant artificial atoms coupled to a 1D waveguide** [**pdf**] [**video**]
SPICE workshop on Quantum Acoustics, Mainz, Germany, May 17–20th 2016

6. **Multiphoton quantum Rabi oscillations in ultrastrong cavity QED**
APS March meeting, Baltimore, USA, March 14–18th 2016

5. **Designing frequency-dependent interaction with a giant artificial atom**
APS March meeting, Denver, USA, March 3–7th 2014

4. **Designing environment structure with a giant artificial atom**
ScaleQIT meeting, Saarbrücken, Germany, February 10–11th 2014

3. **Photon detection with transmons**
STINT workshop, North Stradbroke Island, Australia, April 15–18th 2013

2. **Microwave photon detection with transmons**
PROMISCE meeting, Madrid, Spain, May 21–22nd 2012

1. **Perfect reversal of measurement back-action in circuit QED**
   Quantum Machines summer school, Les Houches, France, July 4–29th 2011

Seminars at universities, popular science presentations, etc.

55. **Kvantdatorer och annan kvantteknologi**
    Guest lecture for high school physics students, Chalmers University of Technology, Gothenburg, Sweden, February 24th 2025

54. **Architecture considerations for superconducting quantum processors**
    Seminar (online), IFF-CSIC, Madrid, Spain, January 21st 2025

53. **Architecture considerations for superconducting quantum processors**
    The 178th RIKEN Quantum Computing Seminar, RIKEN, Wako, Japan, December 27th 2024

52. **Giant atoms — a new frontier in quantum optics**
    Colloquium (online), Center for Quantum Optics and Informatics, King Abdulaziz City for Science and Technology (KACST), Saudi Arabia, November 20th 2024

51. **Extending quantum optics and developing quantum computers**
    WACQT/WINQ new assistant/associate professors meeeting, Stockholm, Sweden, August 19th 2024

50. **Extending quantum optics and developing quantum computers**
    WACQT Review Meeting, Gothenburg, Sweden, May 15th 2024

49. **AI och kvantteknologi**
    SEB family offices customer lunch on AI, Stockholm, Sweden, March 11th 2024

48. **Generating families of three-qubit gates from simultaneous two-qubit gates**
    Seminar (online), Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany, February 28th 2024

47. **Kvantdatorer och annan kvantteknologi**
    Guest lecture for high school physics students, Chalmers University of Technology, Gothenburg, Sweden, February 27th 2024

46. **Giant atoms — a new frontier in quantum optics**
    Condensed Matter Seminar Series, Niels Bohr Institute, Copenhagen, Denmark, January 24th 2024

45. **Quantum technology and WACQT**
    Seminar for West Sweden Chamber of Commerce visiting WACQT, Gothenburg, Sweden, January 17th 2024

44. **Quantum technology and WACQT**
    Seminar, Department of Chemistry & Molecular Biology, University of Gothenburg, Gothenburg, Sweden, January 16th 2024

43. **Measuring the quantum state of a photoelectron**
    Seminar, RIKEN, Wako, Japan, December 28th 2023

42. **Quantum technology and WACQT**
    Seminar for Stena Teknik, Gothenburg, Sweden, December 12th 2023

41. **WACQT and quantum technology**
Online seminar for RISE, Sweden, February 14th 2023

40. **Ny teknik med kvantfysik**
Rotary, Gothenburg, Sweden, December 7th 2022

39. **Building a quantum computer at WACQT**
CSE Colloquium, Chalmers University of Technology, Gothenburg, Sweden, November 9th 2022

38. **Quantum state and process tomography with machine learning and gradient descent**
Colloquium in Mathematical Modelling and Analysis (online), Umeå University, Umeå, Sweden, November 2nd 2022

37. **WACQT, kvantteknologi och kvantdatorer**
Forum för tekniska fysiker – bakom forskningslabbets väggar, Chalmers University of Technology, Gothenburg, Sweden, November 1st 2022

36. **Kvantdatorer: nutid och framtid**
IT Insights, Aurora Live, Stockholm, Sweden, October 11th 2022

35. **Giant atoms — a new frontier in quantum optics**
Seminar in Theoretical Physics (online), University of Massachusetts Lowell, Boston, USA, October 6th 2022

34. **Quantum state and process tomography with machine learning and gradient descent**
Seminar, RIKEN, Wako, Japan, August 16th 2022

33. **Ny teknik med kvantfysik**
Vetenskapsfestivalen, Gothenburg, Sweden, May 2–13th 2022

32. **Quantum technology, WACQT, and logistics**
Lunch & Learn at Einride (online), Sweden, November 24th 2021

31. **Giant atoms — a new frontier in quantum optics**
Theoretical Physics Seminar, University of Gothenburg, Gothenburg, Sweden, November 11th 2021

30. **Quantum technology, WACQT, and finance**
Webinar on quantum technology at SEB (online), Sweden, November 11th 2021

29. **Kvantdatorer och kvantteknologi i Sverige och världen**
Lecture for the employees of Active Solution, Marstrand, Sweden, September 18th 2021

28. **Giant atoms — a new frontier in quantum optics**
Theoretical Seminar (online), ITMO University, Saint Petersburg, Russia, May 12th 2021

27. **Giant atoms — a new frontier in quantum optics**
Seminar (online), Max Planck Institute for Quantum Optics, Garching, Germany, January 15th 2021

26. **Giant atoms — a new frontier in quantum optics**
Docent lecture (online), Chalmers University of Technology, Gothenburg, Sweden, December 17th 2020

25. **Kvantteknologi**
    Lecture (online) for Swedish high-school students, European Quantum Week, November 2nd 2020

24. **Kvantteknologi**
    Guest lecture (online) for physics students, Karlstad University, Karlstad, Sweden, September 17th 2020

23. **Kvantdatorer och stora atomer**
    Seminar for Engineering Physics students, Chalmers University of Technology, Gothenburg, Sweden, February 12th 2020

22. **Enabling ultrastrong-coupling phenomena with single-drive Jaynes-Cummings models**
    Seminar, RIKEN, Wako, Japan, January 28th 2020

21. **Protected interaction and oscillating bound states with giant atoms**
    Seminar, University of Tokyo, Tokyo, Japan, January 24th 2020

20. **Protected interaction and oscillating bound states with giant atoms**
    Seminar, RIKEN, Wako, Japan, January 24th 2020

19. **Entangled states and nonlinear optics using ultrastrong coupling**
    Seminar, National Tsing Hua University, Hsinchu, Taiwan, May 1, 2019

18. **Quantum optics with giant atoms**
    Seminar, National Tsing Hua University, Hsinchu, Taiwan, May 1, 2019

17. **Introduction to (quantum) machine learning**
    Seminar, Bionanophotonics division, Chalmers University of Technology, Gothenburg, Sweden, March 15th 2019

16. **Introduction to (quantum) machine learning**
    Seminar, RIKEN, Wako, Japan, January 24th 2019

15. **Relevance of nanoscience research for society**
    Seminar, Chalmers University of Technology, Gothenburg, Sweden, November 27th 2018

14. **Giant atoms and ultrastrong coupling**
    Future of Nano@Chalmers, Chalmers University of Technology, Gothenburg, Sweden, November 26th 2018

13. **Exploring new regimes of quantum optics: giant atoms and ultrastrong coupling**
    Seminar, Tsinghua University, Beijing, China, July 11th 2018

12. **Exploring new regimes of quantum optics: giant atoms and ultrastrong coupling**
    Seminar, Università di Messina, Messina, Italy, May 31st 2018

11. **Exploring new regimes of quantum optics: giant atoms and ultrastrong coupling**
    Seminar, Chalmers University of Technology, Gothenburg, Sweden, May 7th 2018

10. **New regimes of quantum optics: giant atoms and ultrastrong coupling**
    Seminar, MIT, Boston, USA, March 20th 2018

9. **The fully quantized dynamical Casimir effect — vacuum Casimir-Rabi oscillations in optomechanical systems**
   Seminar, Chalmers University of Technology, Gothenburg, Sweden, August 7th 2017

8. **Breaking excitation-number conservation with ultrastrong coupling**
   Seminar, Lund University, Lund, Sweden, September 29th 2016

7. **Leggett-Garg inequality violations with a large ensemble of qubits**
   Seminar, Chalmers University of Technology, Gothenburg, Sweden, September 28th 2016

6. **Applications of ultrastrong coupling: Cutting Feynman loops and engineering multiphoton Rabi oscillations**
   Seminar, Karlsruhe Institute of Technology, Karlsruhe, Germany, May 16th 2016

5. **Applications of ultrastrong coupling: Cutting Feynman loops and engineering multiphoton Rabi oscillations**
   Seminar, Chalmers University of Technology, Gothenburg, Sweden, May 4th 2016

4. **Quantum optics with surface acoustic waves**
   Seminar, University of Tokyo, Tokyo, Japan, October 20th 2015

3. **Quantum optics with surface acoustic waves**
   Qulink seminar, National Institute of Informatics, Tokyo, Japan, April 27th 2015

2. **Undoing measurement-induced dephasing in circuit QED**
   Linnaeus seminar, Chalmers University of Technology, Gothenburg, Sweden, February 27th 2012

1. **Measuring qubits in a resonator — back-action and how to undo it**
   Seminar, University of Queensland, Brisbane, Australia, June 7th 2011

Posters

11. **Decoherence-free interaction between giant atoms in waveguide QED**
    Light at the Nanoscale: From Molecules to Quantum Computers, Gothenburg, Sweden, December 5–6th 2019

10. **Decoherence-free interaction between giant atoms in waveguide QED**
    WE-Heraeus Seminar: Scalable Hardware Platforms for Quantum Computing, Bad Honnef, Germany, January 13–16th 2019

9. **Decoherence-free interaction between giant atoms in waveguide QED**
   International Symposium on Quantum Fluids and Solids, Tokyo, Japan, July 25–31st 2018

8. **Quantum optics with giant artificial atoms in a 1D waveguide**
   CEMS International Symposium on Dynamics in Artificial Quantum Systems, Tokyo, Japan, January 15–17th 2018

7. **Quantum optics with giant artificial atoms in a 1D waveguide**
   SAWtrain summer school: Physics and applications of GHz vibrations in semiconductors, Cargèse, France, July 11–21st 2017

6. **Quantum optics with giant artificial atoms**
   CIQM Frontiers in Quantum Materials and Devices Workshop, Tokyo, Japan, June 13–14th 2016

5. **Quantum optics with giant artificial atoms**
   CEMS International Symposium on Dynamics in Artificial Quantum Systems, Tokyo, Japan, January 12–14th 2016

4. **Quantum optics with giant artificial atoms**
   International Symposium on Nanoscale Transport and Technology, NTT, Atsugi, Japan, November 17–20th 2015

3. **Designing frequency-dependent relaxation rates and Lamb shifts for a giant artificial atom**
   Chalmers Area of Advance Nanoscience and Nanotechnology, workshop, Uddevalla, Sweden, June 2014

2. **Quantum nondemolition detection of a propagating microwave photon**
   Frontiers in Quantum Engineered Devices, Obergurgl, Austria, August 2013

1. **Undoing measurement-induced dephasing in circuit QED**
   MC2 day, Gothenburg, Sweden, August 2012

Media

Anton Frisk Kockum

Newspaper articles

3. **Kvantforskare har lyckats teleportera**
   Svenska Dagbladet, February 11th, 2025

2. **Jättens genombrott – sparar en kvadriljon år**
   Svenska Dagbladet, December 10th, 2024

1. **Sverige slåss om att hinna först med kvantdatorn**
   Dagens Industri, March 11th, 2022

TV

1. **Vad är kvantteknologi?**
   UR Samtiden — Vetenskapsfestivalen 2022, UR Play / Kunskapskanalen, June 20th, 2022

Radio and podcasts

1. **Myten om kvantdatorer**
   Amaras lag, Ny Teknik, March 1st, 2022

Peer review

Anton Frisk Kockum

Journal articles

Web of Science profile (158 reviews for 33 journals)

Journal	Reviews	Impact factor (2023)
Nature	2	50.5
Reviews of Modern Physics	3	45.9
Nature Reviews Physics	2	44.8
Science	1	44.7
Nature Electronics	2	33.7
IEEE Transactions on Pattern Analysis and Machine Intelligence	1	20.8
Science Bulletin	2	18.8
Nature Physics	6	17.6
Newton	1	N/A
Nature Communications	3	14.7
Physical Review X	8	11.6
PRX Quantum	13	9.3
Physical Review Letters	16	8.1
npj Quantum Information	7	6.6
Communications Physics	2	5.4
Advanced Quantum Technologies	2	4.4
Physical Review Applied	3	3.8
Scientific Reports	6	3.8
Physical Review Research	3	3.5
Applied Physics Letters	1	3.5
Sensors	2	3.4
Chinese Optics Letters	1	3.3
Physical Review B	3	3.2
Optics Express	3	3.2
Computational and Theoretical Chemistry	1	3.0
New Journal of Physics	2	2.8
Physical Review A	22	2.6
IEEE Transactions on Quantum Engineering	2	2.5
Quantum Information Processing	31	2.2
Annalen der Physik	1	2.2
Photonics	2	2.1
Japanese Journal of Applied Physics	1	1.5
Journal of Physics Communications	3	1.1

Grant applications

Agency	Grant	#	Year
Vinnova	Collaborative project for civil-military synergies	13	2024
Vinnova	Acceleration of deep tech companies	8	2024
Vinnova	Emerging technology solutions within quantum technology and synthetic biology	5	2024
Swiss National Science Foundation		1	2023
Vinnova	Acceleration of deep tech companies	9	2023
Vinnova	Emerging technology solutions stage 1	5	2023
Swedish Research Council	Research project grant, natural and engineering sciences	1	2023
European Research Council	ERC Advanced Grant	2	2022
Vinnova	Quantum Sweden Genomförbarhetsstudier	1	2022
Vinnova	Quantum Step-Up	6	2022
Dutch Research Council	NGF Quantum Technology	1	2022
Vinnova	Quantum Kick-Start	6	2021
Austrian Science Fund	Stand-alone Projects	1	2021
Israel Science Foundation	Research Grants in Quantum Technologies and Science	1	2021
Dutch Research Council	NWO's Open Competition Domain Science - KLEIN	1	2019
Dutch Research Council	NWO's Physics Vrije Programma's	1	2018

Recognition

APS Outstanding Referee (2025)
IOP Trusted Reviewer (2020)

Committee work

Anton Frisk Kockum

Education committees

WACQT graduate school
September 2023 –

Prize committees

Lise Meitner award committee
2025 – 2028

Other

Quantum Community Network (EU Quantum Flagship)
2025 –
Swedish representative, appointed by the Swedish Research Council

Conference organization

Anton Frisk Kockum

Statistics

Member of the organization committee for 9 international conferences and workshops
Member of the advisory committee for 1 international conference

Member of the organization committee

Molecular Frontiers
Gothenburg, Sweden
November 24–25th 2025

4th WACQT Summer School
Aspenäs, Gothenburg, Sweden
August 18–22nd 2025

2nd International Workshop on Quantum Optics with Giant Atomic Emitters
Gothenburg, Sweden
December 4–6th 2024
Chair of the organization committee

EDU-WACQT teachers' network workshop
Gothenburg, Sweden
November 19–20th 2024

EuroNanoForum
Lund, Sweden
June 11–13th 2023
Chair of the program committee for the session on quantum technology

WACQT Virtual Workshop on Quantum Technology
Gothenburg, Sweden (online)
April 26–27th 2023

Machine Learning for Quantum Control and Quantum Computing, ML(QC)^2
Stockholm, Sweden
August 29th – September 2nd 2022

Workshop on Enabling Technology and Algorithms for Quantum Computing
Gothenburg, Sweden (online)
April 13–14th 2021

Area of Advance Nano – Community Building Activity
Marstrand, Sweden
June 16–18th 2014

Member of the advisory committee

International Workshop on Solid-State Quantum Information and Quantum Computing
Shangrao, China
November 1–4th, 2019

Courses on pedagogy

Anton Frisk Kockum

I have completed the course

Supervising research students (CLS905)
3.0 higher education credits, 2020

and the following courses on pedagogy, which together qualified me for a Diploma in Teaching and Learning in Higher Education (15 higher education credits), which I received in December 2020:

Ethics, science and society (FCIU015)
3.0 higher education credits, 2011

Teaching, learning and evaluation (FCIU010)
3.0 higher education credits, 2012

Diversity and inclusion for learning in higher education (CIU965)
2.0 higher education credits, 2018

Theoretical perspectives on learning (CLS900)
2.5 higher education credits, 2020

Pedagogical project (CIU926)
5.0 higher education credits, 2020

References

Anton Frisk Kockum

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