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Biography

Director Macquarie Centre for Quantum Engineering (MQCQE)
Chief Investigator ARC Centre for Excellence in Engineered Quantum Systems (EQUUS)
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Employment

Professor in QIS (Core)

Professor
School of Mathematical and Physical Sciences
Macquarie University
1 Jan 2022 → present

ARC Centre of Excellence for Engineered Quantum Systems (EQuS)

Macquarie University
1 Jan 2011 → present

Macquarie University Research Centre in Quantum Science and Technology

Macquarie University
1 Jan 2009 → present

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Macquarie University
1 Jan 2023 → 31 Dec 2027

Research outputs

Efficient fault-tolerant quantum protocol for differential privacy in the shuffle model

Asghar, H., Mukherjee, A. & Brennen, G. K., 18 Mar 2026, In: Quantum Information Processing. 25, 4, p. 1-27 27 p., 104.

Entanglement-enhanced quantum sensing via optimal global control with neutral atoms in a cavity

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Cavity polariton blockade for non-local entangling gates with trapped atoms

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Global variational quantum circuits for arbitrary symmetric state preparation

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Symmetry-protected topological Haldane phase on a qudit quantum processor

Edmonds, C. L., Rico, E., Arrazola, I., Brennen, G. K., Meth, M., Blatt, R. & Ringbauer, M., Apr 2025, In: PRX Quantum. 6, 2, p. 020349-1-020349-13 13 p., 020349.

Isolated atoms, but entangled: Confined light connects atomic qubits to enable networked quantum processors

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High-rate quantum LDPC codes for long-range-connected neutral atom registers

Pecorari, L., Jandura, S., Brennen, G. K. & Pupillo, G., 28 Jan 2025, In: Nature Communications. 16, 1, p. 1-9 9 p., 1111.

Density classification with non-unitary quantum cellular automata

Wagner, E., Dell'Anna, F., Nigmatullin, R. & Brennen, G. K., Jan 2025, In: Entropy. 27, 1, p. 1-35 35 p., 26.

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Imaging stars with quantum error correction

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Entanglement in quantum field theory via wavelet representations

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Directed percolation in nonunitary quantum cellular automata

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An Australian strategy for the quantum revolution

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Quantum attacks on Bitcoin, and how to protect against them

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Room-temperature spontaneous superradiance from single diamond nanocrystals

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Holonomic quantum computing in symmetry-protected ground states of spin chains

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Press/Media

A new entanglement-enhanced quantum sensing scheme

Brennen, G., Pupillo, G., Srivastava, V. & Jandura, S.

20/03/26

1 item of Media coverage

A New Quantum Technique Could Change How We Study The Universe

Brennen, G.

29/05/22

1 item of Media coverage

NEW TECHNIQUE INTRODUCING FOREIGN ATOMS IN OPTICAL TRAPPING ALLOWS GREATER MANIPULATION OF NANOPARTICLES

Brennen, G.

15/11/16 → 26/12/16

2 items of Media coverage

New white paper maps the very real risks that quantum attacks will pose for Bitcoin

Brennen, G.

1/11/17 → 9/11/17

9 items of Media coverage

Quantum breakthrough could lead to planet-sized telescopes

Brennen, G.

31/05/22

1 item of Media coverage

Quantum computers could slash the energy use of cryptocurrencies

Brennen, G.

20/06/23

1 item of Media coverage

Quantum mass radar

Brennen, G.

1/11/17

1 item of Media coverage

TINY DIAMONDS LIGHT THE WAY FOR NEW QUANTUM TECHNOLOGIES

Brennen, G.

31/10/17 → 1/11/17

2 items of Media coverage

Awards

ARC SAC - 2025 (CE26): Appointment as member of the ARC CE26 Selection Advisory Committee 2025 - Gavin Brennen

Brennen, G. (Primary Chief Investigator)

20/03/25 → 31/12/25

Projects

AQUTE - Atomic Quantum Technologies

Brennen, G. (Primary Chief Investigator)

1/02/10 → 31/01/13

Australian Dark Matter Detector for High Mass Axions

Volz, T. (Primary Chief Investigator), Tobar, M. (Chief Investigator), Goryachev, M. (Chief Investigator), Ivanov, E. (Chief Investigator), Fedorov, A. (Chief Investigator), Bowen, W. (Chief Investigator), Drinkwater, M. (Chief Investigator), Brennen, G. (Chief Investigator), Twamley, J. (Chief Investigator), Altin, P. (Chief Investigator), Doherty, A. (Chief Investigator) & Rbyka, G. (Partner Investigator)

Engineered quantum matter: fundamentals and new technologies

Brennen, G. (Primary Chief Investigator)

3/01/18 → ...

SQA: Large Baseline Quantum Networks for Super-Resolution Imaging

Brennen, G. (Primary Chief Investigator) & Huang, Z. (Chief Investigator)

1/03/21 → 29/02/24

Mid-level high performance computing (HPC) facility to increase the impact of theoretical output

Steel, M. (Primary Chief Investigator), Wardle, M. (Chief Investigator), Downes, J. (Chief Investigator), Spence, D. (Chief Investigator), Rabeau, J. (Chief Investigator), Dawes, J. (Chief Investigator), Pask, H. (Chief Investigator), Twamley, J. (Chief Investigator), Carman, R. (Other) & Brennen, G. (Chief Investigator)

1/01/09 → 31/12/09

New particle physics on a table top: quantum braiding, quantum computing, and beyond

Pfeifer, R. (Primary Chief Investigator) & Brennen, G. (Sponsor)

16/06/14 → 7/10/16

Quantum algorithms for computational physics

Berry, D. (Primary Chief Investigator), Brennen, G. (Chief Investigator), Childs, A. (Chief Investigator), Pachos, J. K. (Chief Investigator) & Aspuru-Guzik, A. (Chief Investigator)

1/01/16 → 20/09/19

Quantum limits on measurements in a universe with a minimum length scale

Menicucci, N. C. (Chief Investigator), Brennen, G. (Primary Chief Investigator) & Kempf, A. (Chief Investigator)

23/03/20 → 22/03/23

Quantum Science and Technology (QSciTech)

Molina-Terriza, G. (Primary Chief Investigator), Twamley, J. (Chief Investigator), Shparlinski, I. (Chief Investigator), Town, G. (Chief Investigator), Gilchrist, A. (Chief Investigator), Brennen, G. (Chief Investigator), Steel, M. (Chief Investigator), Cresser, J. (Chief Investigator), Rabeau, J. (Chief Investigator), Terno, D. (Chief Investigator), Brown, L. (Chief Investigator), Bulger, D. (Chief Investigator), Rebic, S. (Chief Investigator) & Marshall, G. (Chief Investigator)

1/01/09 → 31/12/16

SQA : SQA Career Development Fund - Round 4

Brennen, G. (Primary Chief Investigator)
1/07/21 → 30/06/25

Sydney Quantum Academy PhD Top-Up Scholarship_Brennen/Wagner

Brennen, G. (Primary Chief Investigator) & Wagner, E. (Student)

Sydney Quantum Academy PhD Top-Up Scholarship_Burgarth/Hahn

Hahn, A. (Student), Burgarth, D. (Primary Chief Investigator) & Brennen, G. (Associate Investigator)
1/03/20 → 31/03/24

SQA 2024 Round 12: Sydney Quantum Academy Scholarship Asghar/Pham

Asghar, H. (Primary Chief Investigator) & Brennen, G. (Supervisor)
23/02/26 → 22/02/30

Sydney Quantum Academy Scholarship Brennen / Vedl

Brennen, G. (Primary Chief Investigator)
1/10/22 → 30/09/26

SQA Round 7: Sydney Quantum Academy successful SQA scholarships in Round 7 - Brennen/Gharat

Brennen, G. (Primary Chief Investigator)
15/01/23 → 14/01/27

ACQC: The Australian Centre for Quantum Growth (ACQC) Program: Quantum Australia

Brennen, G. (Chief Investigator), Dawes, J. (Chief Investigator) & Reed, M. (Other)

Topologically ordered quantum media: unveiling new physics in the collective

Brennen, G. (Primary Chief Investigator)
1/01/13 → 30/06/13

Understanding topological matter: A pathway to robust quantum computation

Singh, S. (Primary Chief Investigator) & Brennen, G. (Sponsor)
1/07/12 → 31/12/13