

Scott Glancy

Applied and Computational Mathematics Division
Information Technology Laboratory
National Institute of Standards and Technology
325 Broadway
Boulder, Colorado 80305 USA
Phone: 303-497-3369
E-mail: sglancy@nist.gov

Research Interests:

Quantum information theory
Statistical analysis of quantum experiments, such as quantum tomography, hypothesis tests of local realism, and secure randomness extraction
Quantum optics theory, linear optics, Gaussian quantum states
Optical quantum information processing
Foundations of quantum mechanics
Ongoing collaborations with experimental groups: quantum optics group of Sae Woo Nam, NIST-Boulder's ion storage group, ultra-cold atom group of Trey Porto and William Phillips

Education:

University of Notre Dame, Ph.D. in Physics with thesis *Optical Implementations of Quantum Computers, Focusing On Linear Optics And Coherent State Implementations* (advisors: Prof. John LoSecco and Prof. Carol Tanner), 2004
Boston College, M.S., Physics, 1999
University of Evansville, B.S., Physics, *summa cum laude*, 1997

Experience:

Physicist, Applied and Computational Mathematics Division, National Institute of Standards and Technology 2006 – present. Research in quantum information and quantum optics.
National Research Council Postdoctoral Fellow, National Institute of Standards and Technology: September 2004 – 2006. Research in quantum information and quantum optics.
Teaching Assistant, University of Notre Dame: September 1999 - 2004. I led undergraduate laboratories and discussion sections. I also made a complete revision of the undergraduate laboratory manual.
Teaching Assistant, Boston College: September 1997 - May 1999. Duties include undergraduate laboratory instructor and discussion section leader.
University of Evansville Undergraduate Research Grant: May 1996 - May 1997. Research in historical foundations of quantum theory.

Publications:

- J. L. E. Silva, S. Glancy, H. M. Vasconcelos "Quadrature Histograms in Maximum Likelihood Quantum State Tomography" *Phys. Rev. A* in press. [arXiv:1805.07414](https://arxiv.org/abs/1805.07414) [quant-ph].
- The BIG Bell Test Collaboration "Challenging local realism with human choices" *Nature* **557**, 212 (2018). [arXiv:1805.04431](https://arxiv.org/abs/1805.04431) [quant-ph].
- Adam C. Keith, Charles H. Baldwin, Scott Glancy, E. Knill "Joint Quantum State and Measurement Tomography with Incomplete Measurements" [arXiv:1803.08245](https://arxiv.org/abs/1803.08245) [quant-ph].
- Peter Bierhorst, Emanuel Knill, Scott Glancy, Yanbao Zhang, Alan Mink, Stephen Jordan, Andrea Rommal, Yi-Kai Liu, Bradley Christensen, Sae Woo Nam, Martin J. Stevens, Lynden K. Shalm "Experimentally Generated Randomness Certified by the Impossibility of Superluminal Signals" *Nature* **556**, 223 (2018). [arXiv:1803.06219](https://arxiv.org/abs/1803.06219) [quant-ph].
- Peter Bierhorst, Emanuel Knill, Scott Glancy, Alan Mink, Stephen Jordan, Andrea Rommal, Yi-Kai Liu, Bradley Christensen, Sae Woo Nam, Lynden K. Shalm "Experimentally Generated Random Numbers Certified by the Impossibility of Superluminal Signaling" [arXiv:1702.05178](https://arxiv.org/abs/1702.05178) [quant-ph].
- T. R. Tan, Y. Wan, S. Erickson, P. Bierhorst, D. Kienzler, S. Glancy, E. Knill, D. Leibfried, and D. J. Wineland "Chained Bell Inequality Experiment With High-Efficiency Measurements" *Phys. Rev. Lett.* **118**, 130403 (2017). [arXiv:1612.01618](https://arxiv.org/abs/1612.01618) [quant-ph].
- G. B. Silva, S. Glancy, and H. M. Vasconcelos "Investigating Bias In Maximum-Likelihood Quantum-State Tomography" *Phys. Rev. A* **95**, 022107 (2016). [arXiv:1604.00321](https://arxiv.org/abs/1604.00321) [quant-ph].
- J. P. Gaebler, T. R. Tan, Y. Lin, Y. Wan, R. Bowler, A. C. Keith, S. Glancy, K. Coakley, E. Knill, D. Leibfried, and D. J. Wineland "High-Fidelity Universal Gate Set for $^9\text{Be}^+$ Ion Qubits" *Phys. Rev. Lett.* **117**, 060505 (2016). [arXiv:1604.00032](https://arxiv.org/abs/1604.00032) [quant-ph].
- Y. Lin, J. P. Gaebler, F. Reiter, T. R. Tan, R. Bowler, Y. Wan, A. Keith, E. Knill, S. Glancy, K. Coakley, A. S. Sørensen, D. Leibfried, D. J. Wineland "Preparation Of Entangled States Through Hilbert Space Engineering" *Phys. Rev. Lett.* **117**, 140502 (2016). [arXiv:1603.03848](https://arxiv.org/abs/1603.03848) [quant-ph].
- Lynden K. Shalm, Evan Meyer-Scott, Bradley G. Christensen, Peter Bierhorst, Michael A. Wayne, Martin J. Stevens, Thomas Gerrits, Scott Glancy, Deny R. Hamel, Michael S. Allman, Kevin J. Coakley, Shellee D. Dyer, Carson Hodge, Adriana E. Lita, Varun B. Verma, Camilla Lambrocco, Edward Tortorici, Alan L. Migdall, Yanbao Zhang, Daniel R. Kumor, William H. Farr, Francesco Marsili, Matthew D. Shaw, Jeffrey A. Stern, Carlos Abellán, Waldimar Amaya, Valerio Pruneri, Thomas Jennewein, Morgan W. Mitchell, Paul G. Kwiat, Joshua C. Bienfang, Richard P. Mirin, Emanuel Knill, Sae Woo Nam "A Strong Loophole-Free Test Of Local Realism" *Phys. Rev. Lett.* **115**, 250402 (2015). [arXiv:1511.03189](https://arxiv.org/abs/1511.03189) [quant-ph].
- B. G. Christensen, A. Hill, P. G. Kwiat, E. Knill, S. W. Nam, K. Coakley, S. Glancy, L. K. Shalm, Y. Zhang "Analysis Of Coincidence-Time Loopholes In Experimental Bell Tests" *Phys. Rev. A* **92**, 032130 (2015). [arXiv:1503.07573](https://arxiv.org/abs/1503.07573) [quant-ph].
- H. S. Ku, W. F. Kindel, F. Mallet, S. Glancy, K. D. Irwin, G. C. Hilton, L. R. Vale, K. W. Lehnert "Generating And Verifying Entangled Itinerant Microwave Fields With Efficient And Independent Measurements" *Phys. Rev. A* **91**, 042305 (2015). [arXiv:1502.03884](https://arxiv.org/abs/1502.03884) [quant-ph].

- Emanuel Knill, Scott Glancy, Sae Woo Nam, Kevin Coakley, Yanbao Zhang "Bell Inequalities for Continuously Emitting Sources" [*Phys. Rev. A* **91**, 032105 \(2015\)](#). [arXiv:1409.7732](#) [quant-ph].
- Martin J. Stevens, Scott Glancy, Sae Woo Nam, and Richard P. Mirin "Third-Order Antibunching From An Imperfect Single-Photon Source" [*Optics Express* **22**, 3244 \(2014\)](#).
- Yanbao Zhang, Scott Glancy, Emanuel Knill "Efficient Quantification Of Experimental Evidence Against Local Realism" [*Phys. Rev. A* **88**, 052119 \(2013\)](#). [arXiv:1303.7464](#) [quant-ph].
- Scott Glancy, Emanuel Knill, Mark Girard "Gradient-Based Stopping Rules For Maximum-Likelihood Quantum-State Tomography" [*New J. Phys.* **14**, 095017 \(2012\)](#). [arXiv:1205.4043](#) [quant-ph].
- Yanbao Zhang, Scott Glancy, Emanuel Knill "Asymptotically Optimal Data Analysis For Rejecting Local Realism" [*Phys. Rev. A* **84**, 062118 \(2011\)](#). [arXiv:1108.2468](#) [quant-ph].
- Thomas Gerrits, Martin J. Stevens, Burm Baek, Brice Calkins, Adriana Lita, Scott Glancy, Emanuel Knill, Sae Woo Nam, Richard P. Mirin, Robert H. Hadfield, Ryan S. Bennink, Warren P. Grice, Sander Dorenbos, Tony Zijlstra, Teun Klapwijk, and Val Zwiller, "Generation Of Degenerate, Factorizable, Pulsed Squeezed Light At Telecom Wavelengths" [*Optics Express* **19**, 24434 \(2011\)](#). [arXiv:1108.0902](#) [quant-ph].
- F. Mallet, M. A. Castellanos-Beltran, H. S. Ku, S. Glancy, E. Knill, K. D. Irwin, G. C. Hilton, L. R. Vale, and K. W. Lehnert "Quantum State Tomography Of An Itinerant Squeezed Microwave Field" [*Phys. Rev. Lett.* **106**, 220502 \(2011\)](#). [arXiv:1012.0007](#) [quant-ph].
- Hilma Vasconcelos, Liliana Sanz, Scott Glancy "All-Optical Generation Of States For 'Encoding A Qubit In An Oscillator'" [*Optics Lett.* **35**, 3261 \(2010\)](#). [arXiv:1006.0009](#) [quant-ph].
- Thomas Gerrits, Scott Glancy, Tracy S. Clement, Brice Calkins, Adriana E. Lita, Aaron J. Miller, Alan L. Migdall, Sae Woo Nam, Richard P. Mirin, Emanuel Knill "Generation Of Optical Coherent State Superpositions By Number-Resolved Photon Subtraction From Squeezed Vacuum" [*Phys. Rev. A* **82**, 031802\(R\) \(2010\)](#). [arXiv:1004.2727](#) [quant-ph].
- Yanbao Zhang, Emanuel Knill, Scott Glancy "The Statistical Strength Of Experiments To Reject Local Realism With Photon Pairs And Inefficient Detectors" [*Phys. Rev. A* **81**, 032117 \(2010\)](#). [arXiv:1001.1750](#) [quant-ph].
- S. Glancy, H. M. Vasconcelos "Methods For Producing Optical Coherent State Superpositions" [*J. Opt. Soc. Am. B* **25**, 712 \(2008\)](#). [arXiv:0705.2045](#) [quant-ph].
- S. Glancy, E. Knill, H. M. Vasconcelos "Entanglement Purification Of Any Stabilizer State" [*Phys. Rev. A* **74**, 032319 \(2006\)](#). [arXiv:quant-ph/0606125](#).
- S. Glancy and E. Knill "Error Analysis For Encoding A Qubit In An Oscillator" [*Phys. Rev. A* **73**, 012325 \(2006\)](#). [arXiv:quant-ph/0510107](#).
- A. Gilchrist, Kae Nemoto, W. J. Munro, T. C. Ralph, S. Glancy, Samuel L. Braunstein, and G. J. Milburn "Schrödinger Cats and Their Power for Quantum Information Processing" [*J. Opt. B: Quantum Semiclass. Opt.* **6**, S828 \(2004\)](#). [arXiv:quant-ph/0312194](#).
- S. Glancy, H. Vasconcelos, and T. C. Ralph "Transmission Of Optical Coherent State Qubits" [*Phys. Rev. A* **70**, 022317 \(2004\)](#). [arXiv:quant-ph/0311093](#).
- T. C. Ralph, A. Gilchrist, G. J. Milburn, W. J. Munro, and S. Glancy "Quantum Computation With Optical Coherent States" [*Phys. Rev. A* **68**, 042319 \(2003\)](#). [arXiv:quant-ph/0306004](#).

S. Glancy, J. M. LoSecco, H. Vasconcelos, and C. E. Tanner "Imperfect Detectors In Linear Optical Quantum Computers" *Phys. Rev. A* **65**, 062317 (2002). [arXiv:quant-ph/0201047](https://arxiv.org/abs/quant-ph/0201047).

Informal Writing:

S. Glancy "Local Realism, Bell's Inequality, and T-Shirts: An Entangled Tale" NIST's blog, [Taking Measure](#) (2018).

Software Projects:

Joint Quantum State and Measurement Tomography

https://github.com/usnistgov/state_meas_tomo

This software performs simultaneous quantum state and measurement tomography, as described in " Joint Quantum State and Measurement Tomography with Incomplete Measurements" [arXiv:1803.08245](https://arxiv.org/abs/1803.08245) [quant-ph].

Honors, Awards, Professional Affiliations and Activities:

Department of Commerce Gold Medal 2016 awarded to the team that performed one of the first loophole-free tests of local realism.

Paul Ehrenfest Best Paper Award for Quantum Foundations 2015 for "A Strong Loophole-Free Test Of Local Realism"

Information Technology Laboratory Outstanding Contribution Award 2015 for development and application of quantum tomography tools.

Information Technology Laboratory Outstanding Journal Paper Award 2014 for "Efficient Quantification Of Experimental Evidence Against Local Realism"

President of Commerce Children Center Association 2010 – 2012

Mentor for NIST Summer Undergraduate Research Fellow 2008, 2010, 2011, 2012, 2013

University of Notre Dame Arthur J. Schmitt Fellow

Boston College Outstanding Teaching Assistant Award 1999

Member of the American Physical Society

Updated 2018-Aug-18