

Sarah Kaiser

RESEARCH ENGINEER · SCIENCE COMMUNICATOR

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Summary

Experimental quantum physicist who excels at building partnerships and communities. Over eight years experience specializing in quantum cryptography, experimental design, and science communication. Loves working with Python, lasers, and lathes.

Education

University of Waterloo, Institute for Quantum Computing

Waterloo, Canada

PH.D. PHYSICS (QUANTUM INFORMATION)

2012 - 2016

- Quantum key distribution devices: How to make them and how to break them

Bethel University

St. Paul, Minnesota, USA

B.S. IN PHYSICS, B.A. IN MATHEMATICS SUMMA CUM LAUDE WITH HONORS

2007 - 2011

Skills

Programming

Python, Q#, C/C++, DevOps, Mathematica, Solid Edge CAD, and Unix/Windows

Research Interests

Quantum Key Distribution, Quantum Sensing, Optical Metrology, Experiment Automation

Thesis Partnerships

Canadian Space Agency, COM DEV (now Honeywell), Excelitas, Institut National D'Optique

Languages

English, Spanish

Experience

Pensar Development

Seattle, Washington

RESEARCH ENGINEER

2018 - Present

- Managing client relationships by communicating the direction and decisions made by the technical team.
- Building agile teams and processes to ensure that projects always exceed customer expectations.
- Developing hardware and software solutions to customers' advanced research and product development needs.

Macquarie University

Sydney, Australia

POSTDOCTORAL RESEARCH FELLOW

2016 - 2017

- Developed new experimental control and automation for optical and microwave characterization of color centers in nanodiamonds, including expanding to low temperature environments.
- Supervised a number of undergrad and HDR students working in the lab.
- Collaborated on industrial corporate partnership projects to explore industrial applications of current lab research.

University of Waterloo, Institute for Quantum Computing

Waterloo, ON, Canada

MIKE AND OPHELIA LAZARIDIS FELLOW

2012 - 2016

- Characterized optoelectronic network and demonstrated physical side-channel attack on commercial quantum cryptography hardware.
- Helped deliver multiple government grants demonstrating the feasibility of adapting quantum cryptography hardware to satellites.
- Designed optoelectronic systems for single photon detection on a satellite platform for quantum key distribution, as well as the optical characterization of the completed prototypes.
- Developed numerous outreach programs, demos, including an entire museum exhibit to help communicate my research to the public.

Wolfram Research

Urbana-Champaign, IL, USA

JR. KERNEL DEVELOPER

2011 - 2012

- Served on the Information Visualization Team for the Mathematica software program, generating ideas for new software functionality.
- Participated in group development of new program features providing enhanced utility and visualization for the end user.
- Wrote code prototypes to facilitate the development of the new program features decided upon by the team.
- Resolved development issues and resolved submitted bugs in current builds to refine the development of the new features.

National Institute of Standards and Technology

Boulder, CO, USA

UNDERGRADUATE RESEARCH FELLOW

2010 - 2011

- Researched new modeling techniques to improve the theoretical and practical understanding of newly fabricated laboratory devices.
- Implemented proposed algorithms in Mathematica to characterize and predict future device behavior.
- Participated in lab group collaborations to resolve experimental and theoretical issues.

California Institute of Technology

UNDERGRADUATE RESEARCH FELLOW

- Engineered and fabricated lab components to aid in facilitating the research project goals.
- Modeled experimental apparatus in Mathematica to better understand the system and its components.
- Collaborated with lab team to identify and successfully meet research challenges.

Pasadena, CA, USA

2009 – 2009

Bethel University

MATH LAB COORDINATOR & TUTOR

- Tutored students in various math courses aiding them with academic success.
- Scheduled and lead math tutor team meetings to create an effective and cohesive team.
- Coordinated math tutoring sessions and available tutors to provide an essential service to university students.
- Organized and maintained participant schedules to insure an efficient service.

St. Paul, MN, USA

Sep. 2007 – May. 2011

Honors & Awards

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| 2020 | MVP Award — Developer Technologies , Microsoft | Seattle, WA |
| 2016 | Equity and Inclusivity Award , University of Waterloo | Waterloo, Canada |
| 2015 | David Johnston Award for Scientific Outreach , Institute for Quantum Computing | Waterloo, Canada |
| 2012-2016 | Mike and Ophelia Lazaridis Fellowship , Institute for Quantum Computing | Waterloo, Canada |
| 2009 | Best Poster Presentation , Sigma Zeta National Convention | Pikeville, KY, USA |
| 2008-2011 | Meritorious Award Winner , COMAP Competition | St. Paul, MN, USA |

Leadership

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| 2020 | Founder , Women in Quantum Computing and Applications Meetup group | Seattle, WA |
| 2019 | Co-Founder, Maintainer , Q# Community | Seattle, WA |
| 2016-2017 | Member of the Women in Physics committee , Australian Institute of Physics | Sydney, Australia |
| 2017 | Member , Macquarie University Equity committee | Sydney, Australia |
| 2015-2016 | Founding Member , Institute for Quantum Computing Equity and Inclusion committee | Waterloo, Canada |
| 2014-2015 | Co-founder & Officer , FemPhys student group at University of Waterloo | Waterloo, Canada |
| 2014-2016 | University of Waterloo Chapter Officer , Optical Society of America | Waterloo, Canada |
| 2014-2015 | Officer , Institute for Quantum Computing Graduate Student Association | Waterloo, Canada |
| 2014-2015 | Co-organizer , Institute for Quantum Computing Entrepreneurship club | Waterloo, Canada |
| 2013 | Local Student Organizer , QCRYPT: Conference on Quantum Cryptography 2013 | Waterloo, Canada |
| 2010-2011 | Chapter President , Bethel University Chapter, Sigma Pi Sigma | St. Paul, MN, USA |
| 2009-2011 | Chapter Officer , Sigma Zeta Bethel University Chapter | St. Paul, MN, USA |

Publications

Learn Quantum Computing with Python and Q#

ISBN 9781617296130

SARAH KAISER, CHRISTOPHER GRANADE

Manning Publications, MEAP began April 2019, Publication in Spring 2020

ABCs of Engineering, Neural Networks for Babies, and Robotics for Babies

Amazon

CHRIS FERRIE AND DR. SARAH KAISER

Sourcebooks Explore, ISBN 1492671215, ISBN 1492671207, ISBN 1492671193 (2019)

Airborne demonstration of a quantum key distribution receiver payload

<http://doi.org/chbs>

CHRISTOPHER J. PUGH, SARAH KAISER, JEAN-PHILIPPE BOURGOIN, JEONGWAN JIN, NIGAR SULTANA, SASCHA AGNE, ELENA

ANISIMOVA, VADIM MAKAROV, ERIC CHOI, BRENDON L. HIGGINS, THOMAS JENNEWEIN

Quantum Science and Technology, 2, 2, 024009 (2017)

Laser damage creates backdoors in quantum communications

<http://doi.org/chbt>

VADIM MAKAROV, JEAN-PHILIPPE BOURGOIN, POOMONG CHAIWONGKHOT, MATHIEU GAGNE, THOMAS JENNEWEIN, SARAH

KAISER, RAMAN KASHYAP, MATTHIEU LEGRE, CARTER MINSHULL, SHIHAN SAJEED

Phys. Rev. A 94, 030302 (2016)

Free-space quantum key distribution to a moving receiver

<http://doi.org/bwww>

J-P BOURGOIN, B L HIGGINS, N GIGOV, C HOLLOWAY, C J PUGH, SARAH KAISER, M CRANMER AND T JENNEWEIN

Optics Express Vol. 23, Issue 26, pp. 33437 - 33447 (2015)

Attacks exploiting deviation of mean photon number in quantum key distribution and coin tossing

SHIHAN SAJEED, IGOR RADCHENKO, **SARAH KAISER**, JEAN-PHILIPPE BOURGOIN, ANNA PAPPA, LAURENT MONAT, MATTHIEU LEGRÉ, AND VADIM MAKAROV

Phys. Rev. A 91, 032326 (2015)

<http://doi.org/chbv>

Quantum safe cryptography and security: An introduction, benefits, enablers and challenges ETSI White Paper No. 8.

CONTRIBUTOR

ETSI White Paper No. 8

ISBN:979-10-92620-03-0

Experimental quantum key distribution with source flaws and tight finite-key analysis

FEIHU XU, SHIHAN SAJEED, **SARAH KAISER**, ZHIYUAN TANG, LI QIAN, VADIM MAKAROV, AND HOI-KWONG LO

Phys. Rev. A 92, 032305 (2015)

<http://doi.org/chbw>

Selected Presentations

Hacking Quantum Key Distribution Hardware

SARAH KAISER

Hackaday Superconference 2019

Pasadena, CA, USA

Nov. 2019

Python + Quantum Computing = ♥

SARAH KAISER

Seattle PyLadies September Talknight

Seattle, WA, USA

Sept. 2019

Learning Q# with Python: building the quantum programming community

SARAH KAISER

Microsoft Build 2019

Seattle, WA, USA

May 2019

What is Quantum Machine Learning, and Is It A Thing?

SARAH KAISER

ML4ALL Conference 2019

Portland, OR, USA

Apr. 2019

Quantum Machine Learning in context: What is a quantum algorithm anyway?

SARAH KAISER

Portland Data Science Group

Portland, OR, USA

Oct. 2018

Super Cool Science

SARAH KAISER

Last Frontiers in Quantum Information Science

Seward, AK, USA

Jun. 2017

Spontaneous superradiance from single diamond nanocrystals

SARAH KAISER, CARLO BRADAC, MATTIAS JOHNSON, MATTHEW VAN BREUGEL, BEN BARAGIOLA, ROCHELLE MARTIN,

MATHIEU L. JUAN, GAVIN BRENNEN, THOMAS VOLZ

NDNC 2017

Cairns, Australia

May. 2017

Extending the reach of QKD: Satellite prototype for quantum communication

SARAH KAISER

QSI seminar series

Sydney, Australia

Apr. 2017

Photon phreaking or what quantum can (actually) do for security?

SARAH KAISER, ALAN ROBERTSON

The Gemalto Crypto Club

Sydney, Australia

Feb. 2017

Extending the reach of QKD: Satellite prototype for quantum communication

SARAH KAISER

Quantum Photonics Connections Conference

Sydney, Australia

Nov. 2016

Extending the reach of QKD

SARAH KAISER

Last Frontiers in Quantum Information Science

Juneau, AK, USA

Jun. 2016

Towards satellite-based quantum communication: field testing the QEYSSAT payload

SARAH KAISER, CHRIS PUGH, JEAN-PHILIPPE BOURGOIN, BRENDON HIGGINS, THOMAS JENNEWEIN

ASTRO 2016

Ottawa, Canada

May. 2016

Practical quantum cryptography devices: how to make them and how to break them

SARAH KAISER

QuSciTech Seminar at Macquarie University

Sydney, Australia

April. 2016

Towards satellite-based quantum communication: field testing the QEYSSAT payload

SARAH KAISER, CHRIS PUGH, JEAN-PHILIPPE BOURGOIN, BRENDON HIGGINS, THOMAS JENNEWEIN

SQuInT 2016

Albuquerque, NM, USA

Feb. 2016

What QKD can learn from classical cryptography

SARAH KAISER

Last Frontiers in Quantum Information Science

Homer, AK, USA

Jun. 2015

Outreach

LIGHT Illuminated

MUSEUM EXHIBIT PLANNING, DESIGN, AND CONSTRUCTION

Waterloo, Canada

2014-2015

Canadian Association for Girls in Science Workshop

LECTURER, QUANTUM CRYPTOGRAPHY

Waterloo, Canada

2014-2015

Waterloo Unlimited workshop for high schoolers

LECTURER, USING QUANTUM MECHANICS TO EXPLORE NEW FRONTIERS IN CRYPTOGRAPHY

Waterloo, Canada

2014

Shad Valley workshop

LECTURER, EXPLORING THE FANTASTIC WORLD OF QUANTUM MECHANICS: QUANTUM CRYPTOGRAPHY

Waterloo, Canada

2014

Quantum Cryptography School for Young Students

LECTURER, IMPLEMENTATIONS OF QUANTUM CRYPTOGRAPHY

Waterloo, Canada

2013-2015

Undergraduate School on Experimental Quantum Information Processing

LECTURER

Waterloo, Canada

2013-2014