

# Jiawei Wu

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## About me

I studied optoelectronics in Huazhong University of Science and Technology as an undergraduate. Then I worked on quantum cryptography and information theory in Tsinghua University, where I received PhD degree. Now I am working as a research fellow (postdoc) in Marco Tomamichel's group in Centre for Quantum Technologies, NUS. My research focuses on fundamental aspects of multiparty quantum cryptography.

## Employment History

2023 – now    ♦ **Research Fellow**, Centre for Quantum Technologies, National University of Singapore

## Education

- 2021    ♦ **Visiting student** in Shenzhen International Quantum Academy, Southern University of Science and Technology
- 2017 – 2023    ♦ **Ph.D.** in Physics, Tsinghua University.  
Thesis title: *Theoretical research on finite-block-length quantum secure direct communication.*
- 2013 – 2017    ♦ **B.sc.** **Huazhong University of Science and Technology** in Optoelectronic information.

## Projects

- 2023    ♦ **Patent analysis in quantum secure communication**
- 2016    ♦ **Underwater optical communication**

## Research highlights

- **Build a rigorous framework for analysing quantum secure direct communication protocols**


Quantum secure direct communication is a technique to transmit messages securely through a channel manipulated by a malicious adversary. It was proposed in 2000, but its security had been interpreted only at an intuitive level. In paper *Security of quantum secure direct communication based on Wyner's wiretap channel theory* and *Quantum Secure Direct Communication with Private Dense Coding Using a General Preshared Quantum State*, we provide a way to perform rigorous security analysis based on quantum wiretap channel theory.

- **Understand the overall security when composing cryptographic primitives**








A practical cryptographic system is composed of many smaller primitives. However, it is not clear if the whole system is security even if all the primitives are secure. In *On the composable security of weak coin flipping*, we use a composable framework to examine the security of weak coin flipping under composition and find out that a composable secure weak coin flipping is impossible.

## Research Publications (Total citations: 352)

### Preprints

- 1 J. Wu, M. Hayashi, and M. Tomamichel, *String commitment from unstructured noisy channel*, (in preparation).
- 2 J. Wu, Y. Hu, A. Bansal, and M. Tomamichel, *On the composable security of weak coin flipping*, Jun. 2024.  DOI: 10.48550/arXiv.2402.15233. arXiv: 2402.15233.

### Journal Articles

- 1 B. Wang, J. Wen, J. Wu, *et al.*, “Improving the full quantum eigensolver with exponentiated operators,” *Physical Review B*, vol. 109, no. 24, p. 245 117, Jun. 2024.  DOI: 10.1103/PhysRevB.109.245117. (visited on 11/15/2024).
- 2 J. Wu, G.-L. Long, and M. Hayashi, “Quantum Secure Direct Communication with Private Dense Coding Using a General Preshared Quantum State,” *Physical Review Applied*, vol. 17, no. 6, p. 064 011, 2022.  DOI: 10.1103/PhysRevApplied.17.064011.
- 3 P.-H. Niu, J.-W. Wu, L.-G. Yin, and G.-L. Long, “Security analysis of measurement-device-independent quantum secure direct communication,” *Quantum Information Processing*, vol. 19, no. 10, 2020, ISSN: 1570-0755 1573-1332.  DOI: 10.1007/s11128-020-02840-0.
- 4 D. Pan, Z. Lin, J. Wu, *et al.*, “Experimental free-space quantum secure direct communication and its security analysis,” *Photonics Research*, vol. 8, no. 9, pp. 1522–1531, 2020.  DOI: 10.1364/PRJ.388790.
- 5 L. Yang, J. Wu, Z. Lin, L. Yin, and G. Long, “Quantum secure direct communication with entanglement source and single-photon measurement,” *Science China Physics, Mechanics & Astronomy*, vol. 63, no. 11, p. 110 311, 2020, ISSN: 1869-1927.  DOI: 10.1007/s11433-020-1576-y.
- 6 R. He, J.-G. Ma, and J. Wu, “A quantum secure direct communication protocol using entangled beam pairs,” *EPL (Europhysics Letters)*, vol. 127, no. 5, p. 50 006, 2019, ISSN: 1286-4854.  DOI: 10.1209/0295-5075/127/50006.
- 7 J. Wu, Z. Lin, L. Yin, and G.-L. Long, “Security of quantum secure direct communication based on Wyner’s wiretap channel theory,” *Quantum Engineering*, vol. 1, no. 4, e26, 2019.  DOI: 10.1002/que2.26.

## Skills

- Languages     ◇ English, Mandarin Chinese
- Coding        ◇ Matlab, C,  $\text{\LaTeX}$ , basic level Python
- Misc.          ◇ Academic research,  $\text{\LaTeX}$  typesetting and publishing.

## Miscellaneous Experience

### Awards and Achievements

- 2021     ◇ **Zhuoyu scholarship** of Tsinghua University.
- 2015     ◇ **National Encouragement Scholarship** of China.
- ◇ **Meriterious Winner** in Mathematical Contest in Modeling.