HAEUM KIM

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RESEARCH INTERESTS

- Quantum Computation, Quantum Communication and Quantum Information
- Spin Transport and Quantum Information Processing with Spins
- Circuit Quantum Electrodynamics
- Resource Theory

EDUCATION

Mar. 2017 – Aug. 2024 **KOREA UNIVERSITY** **Seoul, South Korea**
Ph.D. in Department of Physics
- **Advisor:** Prof. Mahn-Soo Choi
- **Full-funded Scholarship**, received by graduate school, Korea university

Mar. 2011 – Feb. 2017 **KOREA UNIVERSITY** **Seoul, South Korea**
B.S. in Department of Physics
- **Military Service,** honorably discharged as an Air Force sergeant (July 2012 – July 2014)
- **Full-funded Scholarship,** received by National Science and engineering scholarship

HONORS AND AWARDS

2021 **Grand Prize**, IonQ & QCenter, Quantum Challenge

PUBLICATIONS

Publication in a refereed journal

- **H. E. Kim** and K. Jeong, "Asymptotic teleportation schemes bridging between standard and port-based teleportation" DOI: 10.1088/2058-9565/ad617e, *2024 Quantum Sci. Technol.* **9** 045014.
- H. Yeo, **H. E. Kim**, K. Jeong, "Approximating maximum independent set on Rydberg atom arrays using local detunings" DOI: https://arxiv.org/html/2402.09180v1, *under review.*
- **H. E. Kim** and K. Jeong, "Port-based entanglement teleportation via noisy resource states" DOI: 10.1088/1402-4896/ad22c6, 2024 *Phys. Scr.* **99** 035105.

Patents

- **H. E. Kim** and K. Jeong, "Method for calculating of boundaries of entanglement in port-based entanglement teleportation system," Korea Patent (App. No. 10-2024-0076152) in 12, June 2024.

EXPERIENCE

Sep. 2024 – Sep. 2025 Postdoctoral Researcher at **UIUC** under Professor **Jong Yeon Lee**.
Funded by *Education and Training Program of the Quantum Information Research Support Center*

April 2024 – June 2024 Internship at **Tokyo University** under Professor **Ryuji Takagi**.
Funded by *Education and Training Program of the Quantum Information Research Support Center*

July 2022 Toured **IonQ, University of Maryland, and Duke University**
Reward of grand prize of Quantum Challenge

June 2022 **Quantum Information Competition** (QCenter)
Participated as "Error mitigation for reliable quantum computation," under team name of "KoKoPos" with Mentor Yosep Kim (details)

Sep. 2022 – Dec. 2022	**Qiskit Advocate Mentorship Program** (IBM) *Participated as mentee in "Fix template optimization bug in Qiskit (#6974)"*
Nov. 2021	**Quantum Challenge** (IonQ & QCenter) *Participated under team name of "Kim&Lee"* (problem, details)
Feb. 2019	**Qiskit Camp 24 Hackathon** (IBM) *Participated as "Simulating Shor's Algorithm in Real Device"* (details)
May 2016 – Feb. 2017	**Creative Challenger Program** (Center for Teaching and Learning, Korea University) *Participated as "Teaching Mathematica® Quantum Mechanics," under team name of "Learning by Teaching" with Advisor Prof. Mahn-Soo Choi*

PRESENTATIONS

Aug. 2024	(**H. E. Kim**) ***Asymptotic teleportation scheme bridging between standard and port-based teleportation***. Poster, AQIS, Sapporo, Japan.
April 2024	(**H.E. Kim**, K. Jeong) ***Asymptotic teleportation schemes bridging between standard and port-based teleportation.*** QISK, BPEX, Busan, Korea.
April 2024	**(H. E. Kim)** ***Port-based entanglement teleportation via noisy resource states***. Poster, QCTiP, the University of Edinburgh, UK.
Dec. 2023	(**H. E. Kim**) ***Port-based Generalized Measurement Teleportation***. Center for Quantum Network's Channel Capacity 2th Workshop, Korea Institute for Advanced Study, Seoul.
Dec. 2023	(**H. E. Kim**) ***Quantum Teleportation***, Shin-il High School, Seoul.
Nov. 2023	(**H. E. Kim**) ***Entanglement Teleportation Based on Noisy Port-based Teleportation***. KISTI-KU-SNU Joint Workshop, Korea University.
Aug. 2023	(**H. E. Kim**) ***Port-based Entanglement Teleportation with Noisy Resource State***. Poster, AQIS, Korea Institute for Advanced Study, Seoul.
April 2023	(**H. E. Kim**) ***Getting Started with Qiskit.*** QST invited Semina, Seoul University.
Jan. 2020	**(H. E. Kim)** ***Robust Quantum State Transfer through Strong Coupling to Bosonic Bath***. QC Lab Semina, Korea University.

TEACHING EXPERIENCES

Mar. 2021 – Feb. 2024	**Undergraduate Student General Physics Laboratory 1&2**, Korea University *Best Score for Course Evaluation: 5.99/6.00*
Mar. 2020 – Feb. 2021	**(TA) Graduate Student Classical Electromagnetic Theory 1&2**, Korea University
Sep. 2019 – Feb. 2020	**Undergraduate Student General Physics Laboratory**, Korea University
Mar. 2017 – Aug. 2019	**(TA) Undergraduate Student Quantum Information**, Korea University *General Physics 1&2, General Mechanics 1, Quantum Information*

PROJECTS

April. 2024 –	Find the lower bound of qubit needed for magic state distillation
Sep. 2023 – Feb. 2024	Variational quantum algorithm
Sep. 2023 – March 2024	Generalization of Port-based teleportation
Sep. 2022 – Aug. 2023	Port-based entanglement teleportation with noisy resource state
Mar. 2022 – Aug. 2023	Entanglement properties in stabilizer states

Mar. 2021 – Feb. 2022	Quantum simulation of topological states of matter in circuit QED system
Mar. 2020 – Feb. 2021	Spin wave theory in 1D frustrated spin chain
Sep. 2018 – Feb. 2020	Quantum state transfer on Bosonic ohmic Bath
Sep. 2017 – Aug. 2018	Classification of topology in condensed matter
Sep. 2016 – Aug. 2017	Realize Shor's algorithm with real quantum device

SKILLS, LICENSES AND CODE ATTRIBUTES

Skills

- **Mathematica**
- **Python –** Qiskit, Pennylane

Licenses

- IBM Certified Associate Developer – Quantu.m Computation using Qiskit v0.2X

Code Attributes

- Fix template optimization bug in Qiskit
- Local Clifford equivalent of stabilizer states
- Decompose of Clifford operators to single and two qubit gates
- First version of Open Quantum System in Q3 at 'Kraus.wl' package

PROFESSIONAL ORGANIZATIONS

Aug. 2022 –	Qiskit Advocate