

Hyeonjae Kim

Researcher at Agency for Defense Development

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Research Interests

Quantum sensing, Quantum simulation, Quantum computing

Education

Kyungpook National University (KNU)

Daegu, Republic of Korea

Bachelor of Science in Physics

Mar. 2020 – Feb. 2024

Overall GPA: 4.11/4.3 (130 credits) | Major GPA: 4.19/4.3 (71 credits)

Research Experiences

Agency for Defense Development (ADD)

Daegu, South Korea

Researcher (PI: Dr. Sin Hyuk Yim, Dr. Sangkyung Lee)

Jun. 2024 – Present

- Designed and implemented absorption spectroscopy setups for alkali vapor cells and performed theoretical modeling of spectral line shapes.
- Developed software tools for estimating buffer gas pressure and monitoring alkali atom number density from measured spectra.
- Conducted long-term aging tests on cubic glass Rb vapor cells and experimentally verified the lifetime improvement provided by Al_2O_3 wall coatings.
- Implemented a SERF-regime OPM setup and performed Bloch-equation-based modeling to analyze the expected magnetic response and operational parameters.
- Established environmental monitoring systems—vacuum and temperature—and designed mechanical mounts.

Novel Applied Nano Optics Lab

Daegu, South Korea

Research Intern (Advisor: Prof. Junyeob Yeo)

Jun. 2021 – Jun. 2022

Research on photo-electrochemical cells using lasers

High Energy Physics Lab (Moon Lab)

Daegu, South Korea

Research Intern (Advisor: Prof. Chang-Sung Moon)

Jun. 2020 – Feb. 2021

Research on algorithm development for silicon detectors

Publications

Aging test of atomic vapor cell with Al_2O_3 wall coating on cubic glass

Applied Optics **64**, 7932-7937 (2025)

H. Kim, T. Jeong, S. H. Hong, J. B. Nam, S. Lee, Y. Lim, and S. H. Yim

Conferences

Towards the SERF regime in an atomic magnetometer

Korean Physical Society (KPS) Fall Meeting (2025)

H. Kim, Y. Lim, S. Lee, S. H. Hong, S. H. Yim, T. Jeong, and J. B. Nam

Lifetime extension of Rubidium vapor cells by Al_2O_3 coating

APS Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting (2025)

H. Kim, T. Jeong, S. Lee, and S. H. Yim

Demonstration of atom spin gyroscope operating with high bandwidth over 100 Hz

APS Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting (2025)

S. H. Yim, S. Lee, T. Jeong, J. B. Nam, D. Kim, S. H. Hong, and H. Kim

Linear absorption spectroscopy in rubidium vapor cells: Applications in buffer gas measurement and lifetime estimation

Korean Physical Society (KPS) Spring Meeting (2025)

H. Kim, T. Jeong, S. Lee, J. B. Nam, S. H. Hong, and S. H. Yim

Honors and Awards

Physics Alumni Association Award and Scholarship (Outstanding Graduate)

Feb. 2024

Awarded by the chair of the Physics Alumni Association, Kyungpook National University

Agency for Defense Development Director General's Award

Dec. 2023

2nd prize at the MiliTECH Challenge hosted by the KAIST

Korea Military Academy President's Award

Dec. 2022

2nd prize at the MiliTECH Challenge hosted by the KAIST

3rd prize of Academic Conference

Dec. 2021

Awarded by the College of Natural Sciences, Kyungpook National University

Dean's list: 3 semesters (2021-1, 2021-2, 2022-2)

Nov. 2021, Apr. 2022, Apr. 2023

Awarded by the College of Natural Sciences, Kyungpook National University

Grants and Scholarships

National Science and Technology Scholarship

Mar. 2022 – Feb. 2024

Awarded by the Korea Student Aid Foundation (KOSAF)

Academic Encouragement Scholarship (Hyoseok Scholarship)

Apr. 2022

Awarded by the Kyungpook National University Alumni Association

Outstanding students selected from each college (Representative of the College of the Natural Sciences)

Academic Achievement Scholarship

Aug. 2020, Feb. 2021, Aug. 2021

Awarded by Kyungpook National University

A partial tuition reduction granted for academic excellence

Teaching Experiences

Undergraduate Tutoring in Classical Mechanics2 (PHYS212) Courses

Sep. 2023 – Dec. 2023

Teaching Assistant

Undergraduate Tutoring in Electromagnetism2 (PHYS312) Courses

Mar. 2023 – Jun. 2023

Teaching Assistant

Patents and Software

Buffer Gas Pressure Estimation for OPAMs

Dec. 2024

Registered in Korea Copyright Commission (C-2024-047156)

Rubidium Vapor Cell Lifetime Monitoring and Analysis Tool

Dec. 2024

Registered in Korea Copyright Commission (C-2024-054414)

Other Experiences

First Lieutenant at Republic of Korea Air Force

Jun. 2024 – May. 2027

Research Officers for National Defense (Physics, 2/year), counterpart of Israel Talpiot

Tutoring for International Undergraduate Freshmen

Feb. 2022 – May. 2022

Mentored for 2 hours per week on general academic life and basic calculus

Selected as an excellent tutor

Skills

- Programming: Python (NumPy, SciPy, SymPy, pandas, matplotlib), Wolfram Language (Mathematica)
- Software: LabVIEW, Solidworks