

# Hyeonjae Kim

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Researcher at Agency for Defense Development

## Research Interests

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Quantum sensing, Quantum simulation, Quantum computing

## Education

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**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

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**Agency for Defense Development (ADD)**

Daejeon, 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  $\text{Al}_2\text{O}_3$  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

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**Aging test of atomic vapor cell with  $\text{Al}_2\text{O}_3$  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

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**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  $\text{Al}_2\text{O}_3$  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

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**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

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**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

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**Undergraduate Tutoring in Classical Mechanics<sup>2</sup> (PHYS212) Courses** *Sep. 2023 – Dec. 2023*

Teaching Assistant

**Undergraduate Tutoring in Electromagnetism<sup>2</sup> (PHYS312) Courses** *Mar. 2023 – Jun. 2023*

Teaching Assistant

## Patents and Software

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**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

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### **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

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