

# Hyeonjae Kim

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Researcher at Agency for Defense Development

## Research Interests

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AMO Physics, Atom-light interaction, Quantum sensing, Quantum simulation, Quantum computing

## Education

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<b>Kyungpook National University (KNU)</b> Bachelor of Science in Physics Overall GPA: 4.11/4.3 (130 credits)   Major GPA: 4.19/4.3 (71 credits)	Daegu, South Korea Mar. 2020 – Feb. 2024
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## Research Experiences

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<b>Agency for Defense Development (ADD)</b> Researcher (PIs: Dr. Sin Hyuk Yim, Dr. Sangkyung Lee) Research on Optically Pumped Atomic Magnetometers (OPAMs)	Daejeon, South Korea Jun. 2024 – Present
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- 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<sub>2</sub>O<sub>3</sub> 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 (e.g. vacuum, temperature) and designed experimental apparatus.

<b>Novel Applied Nano Optics Lab</b> Research Intern (Advisor: Prof. Junyeob Yeo) Research on photo-electrochemical cells using lasers	Daegu, South Korea Jun. 2021 – Jun. 2022
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<b>High Energy Physics Lab (Moon Lab)</b> Research Intern (Advisor: Prof. Chang-Sung Moon) Research on the development of algorithms for silicon detectors	Daegu, South Korea Jun. 2020 – Feb. 2021
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## Publications

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**Aging test of atomic vapor cell with Al<sub>2</sub>O<sub>3</sub> 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 Al<sub>2</sub>O<sub>3</sub> coating**

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

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

### **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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<b>Physics Alumni Association Award and Scholarship (Outstanding Graduate)</b>	Feb. 2024
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Awarded by the chair of the Physics Alumni Association, Kyungpook National University

<b>Agency for Defense Development Director General's Award</b>	Dec. 2023
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2nd prize at the MiliTECH Challenge hosted by KAIST

<b>Korea Military Academy President's Award</b>	Dec. 2022
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2nd prize at the MiliTECH Challenge hosted by KAIST

<b>3rd prize of Academic Conference</b>	Dec. 2021
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Awarded by the College of Natural Sciences, Kyungpook National University

<b>Dean's list: 3 semesters (2021-1, 2021-2, 2022-2)</b>	Nov. 2021, Apr. 2022, Apr. 2023
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Awarded by the College of Natural Sciences, Kyungpook National University

### Grants and Scholarships

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<b>National Science and Technology Scholarship</b>	Mar. 2022 – Feb. 2024
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Awarded by the Korea Student Aid Foundation (KOSAF)

<b>Academic Encouragement Scholarship (Hyoseok Scholarship)</b>	Apr. 2022
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Awarded by the Kyungpook National University Alumni Association

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

<b>Academic Achievement Scholarship</b>	Aug. 2020, Feb. 2021, Aug. 2021
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Awarded by Kyungpook National University

A partial tuition reduction granted for academic excellence

### Teaching Experiences

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

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

### Patents and Software

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<b>Buffer Gas Pressure Estimation for OPAMs</b>	Dec. 2024
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Registered in Korea Copyright Commission (C-2024-047156)

<b>Rubidium Vapor Cell Lifetime Monitoring and Analysis Tool</b>	Dec. 2024
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Registered in Korea Copyright Commission (C-2024-054414)

## Other Experiences

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### **Research Officer for National Defense (ROND)**

Jun. 2024 – May. 2027

Selected top students (2 per year in Physics) for a program modeled after Israel's Talpiot, completing mandatory military service through research at the Agency for Defense Development, Korea's DARPA counterpart.

Concurrently serving as a First Lieutenant in the Republic of Korea Air Force.

### **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