

# Junhee Cho

GRADUATE RESEARCHER IN QUANTUM COMPUTING AND SEMICONDUCTOR DEVICES

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## Education

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### POSTECH(Pohang University of Science and Technology)

M.S. IN ELECTRICAL ENGINEERING

- GPA: 4.11 / 4.3
- Supervisor: Prof. Moonjoo Lee
- Thesis: Construction of a Cryogenic Ion-Trap Quantum Computing System and Investigation of Light-Induced Charging Effects from Electrode Patches

Pohang, Korea

Mar. 2023 - Present

### Hongik University

B.S. IN ELECTRONIC AND ELECTRICAL ENGINEERING

- GPA: 3.96 / 4.5
- Supervisor: Prof. Ho-Young Cha

Seoul, Korea

Mar. 2016 - Feb. 2023

## Skills

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### Data Analysis & Deep Learning

Python, C, Matlab, PyTorch

### Device Design and Simulation

TCAD (Silvaco Atlas & Athena), SPICE (BSIM4, LTspice, Pspice), MATLAB, Microwind3  
HFSS (Ansys electronics)

### Vacuum System Construction

Pumping system (rotary pump, turbo pump, ion pump and NEG pump), Ti sublimation, Ion gauge

### Laser / Fiber Optics

SM-fiber delivery, double-pass AOM modulation, PID power and frequency lock system

### Material Analysis and Imaging

SEM & EDS, 3D Profiler, XRD

### Quantum Simulation

QUTIP, Qiskit

### Control & Embedded Systems

PyQt (Experimental GUI), FPGA, High-resolution DAC, Arduino, Raspberry Pi

### 3D modeling

Autocad inventor, Rhino 8

## Research Experiences

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### Master's candidate

Pohang, Korea

POSTECH QUANTUM COMPUTING AND QUANTUM NETWORKS LAB.

Mar. 2023 - Present

#### Outline: Construction of cryogenic ion trap system for quantum computing

- Investigated on nonlinear Duffing oscillator dynamics of  $^{174}\text{Yb}^+$  ion motion
- Designed and fabricated a multi-layer ion trap chip to implement a quantum computing platform
- Constructed an ultra-high vacuum (UHV) and electrical delivery system within a cryogenic station
- Implemented a 4 K cryogenic UHV system with EMCCD imaging, achieving successful detection of  $^{40}\text{Ca}^+$  ion fluorescence
- Designed and built a stable laser system and optical path for trapped-ion manipulation
- Developed a PyQt-based user interface(UI) to automate the experimental setup
- Trapped two  $^{40}\text{Ca}^+$  ion qubits and compensated micro-motion by reducing the Lorentzian linewidth in 397 nm spectroscopy
- Investigating how light-induced charging from oxide patches on trap electrodes distorts the trapping potential and drives ion-position drifts through a surface photovoltage (SPV)-based analysis (manuscript in preparation)
- Developing a real-time ion tracking program that employs a CNN model (Faster R-CNN) to automatically identify ion count and positions from EMCCD images (patent application in progress)

### Undergraduate student

Seoul, Korea

HONGIK UNIV. ADVANCED SEMICONDUCTOR TECHNOLOGY LAB.

Aug. 2021 - Dec. 2022

#### Outline: Enhancement-mode operation of depletion-mode GaN HEMT by integrating with clamp circuit

- Modeled and analyzed AlGaN/GaN HEMT using TCAD(Silvaco Atlas)
- Converted TCAD model to Spice model by BSIM3 library
- Implemented a clamp circuit in LTspice to achieve normally-off operation and optimized switching speed
- Achieved high power conversion efficiency in a DC-DC boost converter

## Selected Conferences

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### A Segmented-blade Trap and Oscillatory Motion of Trapped Ions

Okinawa, Japan

MYUNGHUN KIM, JUNHEE CHO, SANGSOO HAN, SEHYEON GWON, HYEGOO LEE, KEUMHYUN KIM AND MOONJOO LEE

Sep. 2024

Advanced Quantum Technologies for Trapped Ions (AQTTI), Poster presentation

### Constructing Ytterbium Ion Trap System for Quantum Computing using Cryostat

Gyeongju, Korea

JUNHEE CHO, MYUNGHUN KIM, SEHYEON GWON, KEUMHYUN KIM, HYEGOO LEE, SANGSOO HAN AND MOONJOO LEE

Feb. 2024

31<sup>st</sup> Korean conference on semiconductors (KCS), Poster presentation

## A segmented-blade trap with biasing rods

MYUNGHUN KIM, JUNHEE CHO, KEUMHYUN KIM, HYEGOO LEE, JUNGSOO HONG AND MOONJOO LEE

Hannover, Germany

7<sup>th</sup> European conference on trapped-ion(ECTI), Poster presentation

Sep. 2023

## Enhancement-mode GaN MOS-HFET with Integrated Clamp Circuit

JUNHEE CHO, SEUNGHEON SHIN AND HO-YOUNG CHA

Jeongseon, Korea

30<sup>th</sup> Korean conference on semiconductors (KCS), Poster presentation

Feb. 2023

## Publications

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- Junhee Cho, Sangsoo Han, Keumhyun Kim, Hyegoo Lee, Yongha Shin, Myunghun Kim, Moonjoo Lee, "Light-Induced Charging and Photovoltage Quenching Dynamics Mediated by Surface Photovoltage in Oxide Patches on Trap Electrodes", *On preparation*
- Seongchan Bae, Myunghun Kim, Junhee Cho, Moonjoo Lee, Jae-Yoon Sim, "A 600-V Peak-to-Peak 65-dBc RF Signal Source for Trapped-Ion Quantum Computing", *IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS II*, (2024)

## Patents

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### Deep learning inference device for ion qubit detection, ion qubit detection system, and ion qubit detection method

MOONJOO LEE, JUNHEE CHO, YONGHA SHIN, KEUMHYUN KIM, HYEGOO LEE

Nov. 2025

- Korea, 10-20250165113

### Heat engine device using a single ion

MOONJOO LEE, MYUNGHUN KIM, JUNHEE CHO

Oct. 2023

- Korea, 10-2024-0006403 (2023)
- USA, 18/744,460 (P202)

## Honors & Awards

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### DOMESTIC AWARDS

Feb. 2023 **On-site Poster Award**, The 30<sup>th</sup> Korean Conference on Semiconductors

Jeongseon, Korea

Feb. 2024 **On-site Poster Award**, The 31<sup>st</sup> Korean Conference on Semiconductors

Gyeongju, Korea

Nov. 2024 **POSTECH Presidential Award**, POSTECH Startup Competition

Pohang, Korea