

Junhee Cho

GRADUATE RESEARCHER IN QUANTUM COMPUTING AND SEMICONDUCTOR DEVICES

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Education

POSTECH(Pohang University of Science and Technology)

Pohang, Korea

M.S. IN ELECTRICAL ENGINEERING

Mar. 2023 - Present

- 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

Hongik University

Seoul, Korea

B.S. IN ELECTRONIC AND ELECTRICAL ENGINEERING

Mar. 2016 - Feb. 2023

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

Skills

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

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

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

31st Korean conference on semiconductors (KCS), Poster presentation

A segmented-blade trap with biasing rods

MYUNG HUN KIM, **JUNHEE CHO**, KEUMHYUN KIM, HYE GOO LEE, JUNG SOO HONG AND MOONJOO LEE

7th European conference on trapped-ion(ECTI), Poster presentation

Hannover, Germany

Sep. 2023

Enhancement-mode GaN MOS-HFET with Integrated Clamp Circuit

JUNHEE CHO, SEUNGHEON SHIN AND HO-YOUNG CHA

30th Korean conference on semiconductors (KCS), Poster presentation

Jeongseon, Korea

Feb. 2023

Publications

- **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

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, HYE GOO LEE

- Korea, 10-20250165113

Nov. 2025

Heat engine device using a single ion

MOONJOO LEE, MYUNG HUN KIM, **JUNHEE CHO**

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

Oct. 2023

Honors & Awards

DOMESTIC AWARDS

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

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

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

Jeongseon, Korea

Gyeongju, Korea

Pohang, Korea