Chou-Wei Kiang

https://billkiang.github.io/
billkiang@outlook.com

Research Interests

Quantum engineering (solid-state systems for quantum sensing, computing, and communications; superconducting microwave circuits), quantum optics, and sensing technologies.

Education

National Taiwan University (NTU), Taipei, Taiwan — Sept. 2018 – June 2022
B.S. in Electrical Engineering (EE) | GPA: **4.24/4.3**, ranked **top 4% (7/196)**
- Selected courses (straight A+): Solid State Electronics, Modern Physics, Integrated Circuit Design, Optoelectronic Electromagnetics, RF Microwave Wireless Systems, Fourier Transform and Fourier Optics, Thermodynamics

Honors & Awards

NTUEE graduation ceremony representative – Top 10 in the class of 2022 — 2018–2022
Dalongdong Baoan Temple Scholarship (5 times) – Merit-based undergraduate scholarship — 2018–2022
NTU Presidential Award – Academic Excellence Award — Fall 2018

Journal Articles

[1] **Chou-Wei Kiang** and Jean-Fu Kiang, "Imaging on underwater moving targets with multistatic synthetic aperture sonar," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 60, Nov. 2022, Art. no. 4211218, [pdf] [IEEE Xplore].

[2] **Chou-Wei Kiang** and Jean-Fu Kiang, "Imaging and motion parameter estimation of flying helicopter with duo airborne SARs in X-Band," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 15, pp. 9623-9638, Nov. 2022, [pdf] [IEEE Xplore].

[3] **Chou-Wei Kiang** and Jean-Fu Kiang, "Quantum Sensing of Geomagnetic Fluctuations and Noise Spectroscopy with Hybrid Short Ramsey-Haar Wavelet Method and NV Ensembles, " *IEEE Transactions on Quantum Engineering*, under review, [pdf].

Conference Presentation (*presenter)

[4] Ze-Wei Chen, **Chou-Wei Kiang***, Chia-Tse Tai, Hao-Chien Wang, Min-Jui Lin, Yen Chuang, and Jiun-Yun Li, "Weak antilocalization of two-dimensional hole gases in a modulation-doped GeSn/Ge heterostructure, " *2024 APS March Meeting*, Minneapolis, MN, USA, Mar. 3-8, 2024 (abstract submitted for review) (upcoming, oral), [abstract].

[5] Yu-Jui Wu*, **Chou-Wei Kiang**, Tsung-Ying Li, Ze-Wei Chen, Min-Jui Lin, Wei-Hsiang Kao, and Jiun-Yun Li, "Conductance anomalies in nanoscale quantum point contact devices on an undoped GeSn/Ge heterostructure, " *2024 APS March Meeting*, Minneapolis, MN, USA, Mar. 3-8, 2024 (abstract submitted for review) (upcoming, oral), [abstract].

Research Experiences

Quantum Electronics Laboratory | Research Assistant — Mar. 2023 – present
Advisor: Prof. Jiun-Yun Li — Department of EE, NTU
- Hall measurement and characterization of undoped and modulation-doped GeSn/Ge heterostructures [4]
  - investigate strain and Sn effect on Rashba spin-orbit coupling by analyzing weak localization/anti-localization patterns
  - extract effective mass and analyze electrical, magneto-transport properties through temperature-dependent SdH oscillations
- Differential conductance measurement and characterization of GeSn/Ge, Ge/GeSi quantum point contact (QPC) devices [5]
  - investigate nonlinear transport properties by sweeping the source-drain bias under different split-gate voltages
  - investigate physical mechanisms behind the measured $0.7(2e^2/h)$ and $0.35(2e^2/h)$ zero-bias conductance anomalies
- Set up apparatus and write Matlab codes to control lock-in amplifiers and voltage source for remote measurements

Digital Image and Signal Processing Laboratory — Sept. 2023 – present
Advisor: Prof. Jian-Jiun Ding — Department of EE, NTU
- propose to use generalized wavelet transform to reconstruct arbitrary magnetic waveform with qubit sensors
- evaluate the performance of Daubechies wavelets, symlets, and coiflets and at various orders and scales in terms of SNR

Group of Electromagnetic Applications | Research Assistant — June 2020 – Sept. 2023
Advisor: Prof. Jean-Fu Kiang — Department of EE, NTU
- Simulations of **quantum sensing** using nitrogen-vacancy (NV) center ensembles [3]
  - implement inverse Haar wavelet transform for quantum sensing with short Ramsey and spin-echo MW control sequences
  - reconstruct a sub-nT arbitrary waveform with sensitivity of 0.63 $\text{pT}/\sqrt{\text{Hz}}$, along with the spin-bath noise spectrum
- Synthetic aperture sonar (SAS) (**remote sensing & signal processing**) [1]
  - propose multistatic SAS configuration to estimate velocity vector of moving submarine within 3% of error
  - design a modified range Doppler algorithm to acquire SAS image by integrating three different time-frequency transforms
- Synthetic aperture radar (SAR) (**remote sensing & microwave radar imaging**) [2]
  - propose a two-stage template matching method to separate backscattered signals from fuselage and fast-spinning rotors
  - propose a duo airborne SAR and phase matching transform to estimate target velocity within 0.03% of error
- Modeling and simulation of optical radiation force (**optics & electromagnetics**) (Report:[pdf])
  - integrate Fourier transform for decomposing an incident Gaussian beam, Lorenz-Mie theory for computing scattered electromagnetic fields, and Maxwell stress tensor for computing the radiation force exerted on a spherical particle

Skills

Physical modeling & simulations: classical simulation of quantum systems; EM, optics, and microwave systems
mK cryogenic system operations: TeslatronPT + KelvinoxJT insert, ProteoxMX (Oxford Instruments)
Transport & conductance measurements: B1500A semiconductor device analyzer (I-V measurement), SR830, SR865A lock-in amplifiers, pre-amplifier, Basel low-noise/high-resolution DAC, superconducting magnet
Programming: Matlab, Python (QuTiP, Tensorflow), C/C++, Verilog
Other skills: LaTeX, Visio, Linux, Solidworks, Meshlab
Languages: English (**TOEFL: 106/120**), Mandarin Chinese

Leadership Experiences

Feb. 2016 – Jan. 2017 Vice-Chairman of Student Association, Taipei Municipal Chien-Kuo Senior High School