YI-CHIA TSAI

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Areas of Interest

- Physics of VLSI Devices, Device Modeling, First Principles, 2D Materials, Electronic Structure

Education

- **National Chiao Tung University (NCTU), Hsinchu, Taiwan** Sept. 2012 to June. 2015
  - Bachelor of Science in Electrical and Computer Engineering (ECE)
  - Graduation Ranking: 1/183
  - GPA Overall: 3.98/4.00 (94.23/100.00), 141 credits Major: 4.00/4.00 (95.81/100.00), 105 credits
- **National Chiao Tung University (NCTU), Hsinchu, Taiwan** Aug. 2015 to present
  - 2nd year Doctor of Philosophy in Communications Engineering (CE)
  - Current GPA: 4.00/4.00 (3.7/4.3), 3 credits
    Adviser: Prof. Yiming Li
- **Stanford University, CA, USA** July. 2016 to Dec. 2016
  - Visiting Student Researcher (VSR) in Prof. Nishi's group.
    Advisers: Dr. Blanka Magyari-Köpe, Prof. Yoshio Nishi

Standardized Test Scores

- TOEFL: iBT Total 101 (Reading:29, Listening:24, Speaking:23, Writing:25) Oct. 2016

Research Experience

- **Quantum Dot Technology** Feb. 2013 to present
  1. *Mutilayers Quantum Dot Array and Solar Cell Application*: Evaluate how the number of quantum dot array layers and the spacing between each layers have impact on its bandstructure, density of state and conversion efficiency in Si/SiC and Ge/Si quantum dot solar cell. In this project, we internationally collaborate with Tohoku university and combine our simulation with their experiment works. (published: [J1][J2][J4][J7][C2])
  2. *Size, Density and Shape of Si/Ge Quantum Dot Array and Solar Cell Application*: Apply the new finite-element method and numerically reveal the Ge/Si quantum dot's configuration have impacted on its bandstructure, density of state, and efficiency in quantum dot solar cell. (published: [J3][B1][C3][C4])
  3. *G-factor Engineering in Nano-Disks*: Tune the g-factor by evaluating the interplay between the inter-band electron state coupling and the wave function confinement in the nano-disks. (published: [J6][C5])

  Advisers: Prof. Yiming Li, Prof. Seiji Samukawa
- **2D Materials: Black Phosphorus** Apr. 2016 to present
  - *Contact Engineering*: Revealing the electronic properties of black phosphorus by *Ab Initio* simulations. The topics including top and edge contact, different contact materials, and the impact of dielectric materials. In this project, we join the research project with Taiwan Semiconductor Manufacturing Company (TSMC). (published: [C1], in preparing: [J5])

  Advisers: Dr. Blanka Magyari-Köpe, Prof. Yiming Li, Prof. Yoshio Nishi

Extracurricular Activities and Teaching Assistant Experience

- **Participate in TSMC Elite Camp** Aug. 2014
  - TSMC exhibits their advantages and points out challenges faced in the global competition.
- **Joining Programming Challenging Contest Association** Sept. 2013 to June. 2014
  - It broaden my algorithm concepts, teamwork skill, and provided the opportunity of participating in programming contests outside of NCTU.
- **Teaching Assistant** Sept. 2015 to Jun. 2016
  - Totally 78 students, majorly assisted freshman in their academic works.

Honors and Distinctions

- **The Valedictorian of ECE** Jun. 2016
  - Recruited as the valedictorian of ECE because of the highest GPA among 183 graduating students even though I already graduated for one year.
- **Four times NCTU Presidential Awards** June. 2013, Feb. 2014, June. 2014, Feb. 2015
  - Cash prize, USD 400; Award for the students whose grades are the top in the class.
- **First prize in NCTU Freshman Cup Programming Contest** Sept. 2013
  - Cash prize, USD 400; A programmming contest that encourages the freshman from all departments to polish their programming skills.
- **ZyXEL Educational Fellowship** June. 2015
  - Cash prize, USD 4,000; The most competitive fellowship in undergraduate schools. The goal of the fellowship is to approve the effort of the honorees and motivate them to go further so that they will contribute to the campus and Taiwan in the future.
- **Excellent work in NCTU ECE Special Project Contest** Sept. 2015
  - Cash prize, USD 140; Topic: Modeling and Simulation of Well-Ordered Ge/Si-Nanodisk Array for Quantum Dot Solar Cells.
- **NCTU PhD Outstanding Fellowship** Sept. 2015
  - Scholarship, USD 14,400; The most competitive fellowship for Ph.D. students.

Publications

- **Journal Papers**
  1. Yi-Chia Tsai, Ming-Yi Lee, Yiming Li, Mohammad Maksudur Rahman, and Seiji Samukawa, "Simulation Study of Multilayer Si/SiC Quantum Dot Superlattice for Solar Cell Applications," *IEEE Electron Device Letters*, vol. 37, no. 6, pp. 758–761, May. 2016.
  2. Yi-Chia Tsai, Ming-Yi Lee, Yiming Li, and Seiji Samukawa, "Design and Simulation of Intermediate Band Solar Cell with Ultra-Dense Type-II Multilayer Ge/Si Quantum Dot Superlattice," *IEEE Transactions on Nanotechnology*, under review, Oct. 2016.
  3. Yi-Chia Tsai, Ming-Yi Lee, Yiming Li, and Seiji Samukawa, "Miniband Formulation in Ge/Si Quantum Dot Array," *Japanese Journal of Applied Physics*, vol. 55, no. 4S, p. 04EJ14, Mar. 2016.
  4. Yi-Chia Tsai, Ming-Yi Lee, Yiming Li, and Seiji Samukawa, "Optimal Design and Simulation of Si/SiC Quantum Dot Superlattice Solar Cells with Al_2O_3 Passivation Layer," *IEEE Journal of Photovoltaics*, submitted, Jan. 2017.
  5. Yi-Chia Tsai, Blanka Magyari-Köpe, Yiming Li, and Yoshio Nishi, "Ab Initio Modeling of Contact Engineering on Few-Layer Black Phosphorus with Air Stability," *Physical Review B*, schedule to be submitted, 2017.

6. Li-Wei Yang, Yi-Chia Tsai, Yiming Li, Aiko Higo, Akihiro Murayama, S. Samukawa, and O. Voskoboynikov, "Tuning of the Electron g-factor in Defect Free GaAs Nanodisks," *Physical Review B*, vol. 92, no. 24, p. 245423, Dec. 2015.
7. Mohammad Maksudur Rahman, Ming-Yi Lee, Yi-Chia Tsai, Akio Higo, Halubai Sekhar, Makoto Igarashi, Mohd Erman Syazwan, Yusuke Hoshi, Kentarou Sawano, Noritaka Usami, Yiming Li, and Seiji Samukawa, "Impact of Silicon Quantum Dot Super Lattice and Quantum Well Structure as Intermediate Layer on p-i-n Silicon Solar Cells," *Progress in Photovoltaics: Research and Applications*, vol. 24, no. 6, pp. 774–780, Dec. 2015.

- **Book Chapters**
  1. Ming-Yi Lee, Yi-Chia Tsai, Yiming Li, and Seiji Samukawa, "Modeling and Simulation of Ge/Si-Nanodisk Array for Quantum Dot Based Intermediate Band Solar Cells," *in S.-K. Liaw and G.-R. Lin (Eds.), Green Photonics and Smart Photonics, The River Publishers*, pp. 25–45, 2016.

- **Conference Papers**
  1. Yi-Chia Tsai, Blanka Magyari-Köpe, Yiming Li, and Yoshio Nishi, "Electronic Properties and Contact Engineering of Black Phosphorus: Insights from *Ab Initio* Simulations," *Initiative for Nanoscale Materials and Processes (INMP)*, Stanford University, USA, Nov. 17, 2016. (Oral)
  2. Yi-Chia Tsai, Ming-Yi Lee, Yiming Li, and Seiji Samukawa, "Miniband Formulation of Bilayer Type II Ge/Si Quantum Dot Superlattices," *Int'l Conf. on Nanotechnology (IEEE NANO)*, Sendai, Japan, Aug. 22-25, 2016. (Oral)
  3. Yi-Chia Tsai, Ming-Yi Lee, Yiming Li, and Seiji Samukawa, "Numerical Simulation of Highly Periodical Ge/Si Quantum Dot Array for Intermediate-Band Solar Cell Applications," *IEEE Int'l Conf. on Simulation of Semiconductor Processes and Devices (IEEE SISPAD)*, Washington DC, USA, Sep. 9-11, 2015. (Oral)
  4. Yi-Chia Tsai, Ming-Yi Lee, Yiming Li, and Seiji Samukawa, "Miniband Formulation in Ge/Si Quantum Dot Array," *Int'l Conf. on Solid-State Devices and Materials (SSDM)*, Sapporo, Japan, Sep. 27-30, 2015. (Oral)
  5. Li-Wei Yang, Yi-Chia Tsai, Yiming Li, Oleksandr Voskoboynikov, Aiko Higo, Akihiro Murayama, and Seiji Samukawa, "Electron g-factor Engineering in GaAs Quantum nano-DisksFabricated by Defect-Free Neutral Beam Etching Process," *Int'l Conf. on Solid-State Devices and Materials (SSDM)*, Sapporo, Japan, Sep. 27-30, 2015.

Skills

- Programming Languages: C/C++, Java
- Engineering and Mathematical Software: VASP, COMSOL, Matlab
- Languages: Mandarin (native), English (fluent), Japanese (beginner)
- Tools: LaTeX, Microsoft Office

References

- **Yiming Li, ymli@faculty.nctu.edu.tw**
  - Professor of Electrical and Computer Engineering, National Chiao Tung University, Taiwan.
- **Blanka Magyari-Köpe, blankamk@stanford.edu**
  - Senior Research Engineer of Electrical Engineering, Stanford University, USA.
- **Stefano Rini, stefano@nctu.edu.tw**
  - Assistant Professor of Electrical and Computer Engineeringy, National Chiao Tung University, Taiwan.

- **Seiji Samukawa, samukawa@ifs.tohoku.ac.jp**
  - Professor of Institute of Fluid Science, Tohoku University, Japan.

ALL ABOVE IS STATED BE FACT WITHOUT EXCEPTION.
JAN. 9, 2017