

# Linsen Li

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## EDUCATION

Department of Electrical Engineering, Tsinghua University, China	Aug 2015 – Jul 2017
Department of Microelectronics, Tsinghua University, China	Aug 2017 – Jul 2019
B.E in Microelectronics, Major GPA: <b>93/100</b> (average device physics related grade: <b>98/100</b> )	Jul 2019
Department of Electronic Engineering and Computer Science, MIT, USA (Special Student) GPA: <b>5.0/5.0</b>	Sep 2017 – Dec 2017
Department of Electronic Engineering and Computer Science, MIT, USA (Graduate Student) GPA: <b>5.0/5.0</b>	Sep 2019 – Present
M.S. in Electrical Engineering and Computer Science	Feb 2021
Ph.D. in Electrical Engineering and Computer Science	TBD

## AWARDS

Conference on Lasers and Electro-Optics (CLEO) Highlighted talk ( <b>Top 3% contributed talk, 43/1405</b> )	Apr 2022
Certificated reviewer for optica publishing group (Formerly OSA: Optical Society of America)	Feb 2022
The pitch winner in Solid-State Defect Engineering session of 2022 MIT CQE-iQuISE annual research conference	Feb 2022
Teaching Assistant in the MIT course: Introduction of Micro/Nano Engineering	Feb 2022
Industry Liaison Officer in Center for Quantum Networks (Student Leadership Council).	Feb 2021
Quantum Information Science and Engineering Network (QISE-NET) Triplet award.	Sep 2020
MIT-IBM Quantum Hackathon First Place Winner.	Feb 2020
Tsinghua Outstanding Graduate ( <b>Top 2% undergraduate in Tsinghua</b> )	Jul 2019
Tsinghua Outstanding Diploma Thesis ( <b>Top 5% Undergraduate Diploma Thesis in Tsinghua</b> )	Jun 2019
Analog Devices Fellowship ( <b>MIT EECS First Year Fellowship</b> )	Jun 2019
Tsinghua Presidential Award ( <b>Highest honor awarded to 10 out of 15000+ undergraduates in Tsinghua University</b> )	Nov 2018
➤ Meritorious Winner of the American Mathematical Contest in Modeling ( <b>Top 10% nationwide</b> )	Apr 2017
➤ Outstanding Award in the 32 <sup>nd</sup> Nation Undergraduate Physics Contest ( <b>Top 10 nationwide</b> )	Nov 2015
➤ Second-place award in the National Undergraduate Electronic Design Contest ( <b>Only winner among freshman</b> )	Sep 2015
➤ Gold medal in 16 <sup>th</sup> Asian Physics Olympiad ( <b>Only 8 students can represent China</b> )	May 2015
➤ First-place award in the 31 <sup>st</sup> China Physics Olympiad ( <b>Ranked 10<sup>th</sup> nationwide</b> )	Nov 2014
➤ Best score in the experiment portion of the 31 <sup>st</sup> China Physics Olympiad ( <b>Ranked 1<sup>st</sup> in experiment nationwide</b> )	Nov 2014

## LEAD PUBLICATIONS (\* BOTH AUTHORS CONTRIBUTED EQUALLY TO THIS WORK.)

- [1]. **Linsen Li**, Lorenzo De Santis, Isaac Harris, Kevin Chen, Yixuan Song, Ian Christen, Matt Trusheim, Carlos Errando-Herranz, Ruonan Han, and Dirk Englund. "Scalable quantum information processing architecture using a programmable array of spin-photon interfaces." In CLEO: QELS\_Fundamental Science, pp. FF4J.1, Optical Society of America. (2022) (**Highlighted**)
- [2]. **Linsen Li**, Hyeonrak Choi, Mikkell Heuck, and Dirk Englund. "Field-based design of a resonant dielectric antenna for coherent spin-photon interfaces." Optics Express, 29, 16469-16476. (2021)
- [3]. **Linsen Li**, Hyeonrak Choi, Mikkell Heuck, and Dirk Englund. "Field-based design of a resonant dielectric antenna for coherent spin-photon interfaces." In CLEO: QELS\_Fundamental Science, pp. FW4I.4, Optical Society of America. (2021)
- [4]. **Linsen Li**, Hyeonrak Choi, and Dirk Englund. "A dielectric antenna for quantum emitter interfaces." Bulletin of the American Physical Society. (2020)
- [5]. He Tian\*, Yuxing Li\*, **Linsen Li\***, Mohammad Ali Mohammad, Renrong Liang, Yi Yang, and Tian-Ling Ren. "Negative capacitance black phosphorus transistors with low SS" IEEE Transactions on electron devices, vol. 66, no. 3, pp. 1579-1583. (2019)
- [6]. **Linsen Li**, Blanka Magyari-Köpe, Ching-Hua Wang, Sanchit Deshmukh, Zizhen Jiang, Haitong Li, Yi Yang, Huanglong Li, He Tian, E. Pop, Tian-Ling Ren, H.-S. Philip Wong. "First principles study of memory selectors using heterojunctions

- of 2D layered materials.” International Electron Devices Meeting (IEDM), 24.3.1-24.3.4. (2018)
- [7]. He Tian\*, **Linsen Li\***, Mohammad Ali Mohammad, Yi Yang, and Tian-Ling Ren. “High-quality reconfigurable black phosphorus p-n junctions.” IEEE Transactions on electron devices, vol. 65, no. 11, pp. 5118-5122. (2018)
- [8]. Yutao Li\*, Guangyang Gou\*, **Linsen Li\***, He Tian, Xin Cong, Zhen-Yi Ju, Ye Tian, Xiang-Shun Geng, Ping-Heng Tan, Yi Yang, Tian-Ling Ren. “Millimeter-scale nonlocal photo-sensing based on single-crystal perovskite photodetector.” iScience 7, 110–119. (2018)
- [9]. **Linsen Li**, Jiadong Yu, Zhibiao Hao, Lai Wang, Jian Wang, Yanjun Han, Hongtao Li, Bing Xiong, Changzheng Sun, Yi Luo. "Influence of point defects on optical properties of GaN-based materials by first principle study." Computational Materials Science 129: 49-54. (2017)
- [10]. **Linsen Li**, Zhibiao Hao. Graphene terahertz emitter and its manufacturing method. Patent Application Number CN201510767570. Filed on Nov. 11 2015. Granted on Nov. 26 2018, Assignee: Tsinghua University.

## CONTRIBUTED PUBLICATIONS

- [1]. Ian Christen, Hamza Raniwala, Marco Colangelo, Kevin Chen, Lorenzo De Santis, **Linsen Li**, Yixuan Song, Carlos Errando-Herranz, Isaac Harris, Eric Bersin, Madison Sutula, Karl Berggren, Matt Trusheim, Dirk Englund "Scalable photonic integration of long-lived tin-vacancy memories at 1.3 K". In Quantum 2.0, pp. QM2A.4, Optical Society of America. (2022)
- [2]. P. Ben Dixon, Ryan Murphy, Matt Grein, W. John Nowak, John Cummings, Dave Kharas, Xingyu Zhang, Katia Shtyrkova, Scott Hamilton, Ian Christen, **Linsen Li**, Eric Bersin, Madison Sutula, Dirk Englund. "Development of multi-qubit silicon vacancy quantum memory module" In Quantum 2.0, pp. QM4B.1, Optical Society of America. (2022)
- [3]. Genevieve Clark, Matthew Koppa, Kevin Chen, Andrew Leenheer, **Linsen Li**, Daniel Dominguez, Mark Dong, Matthew Saha, D. Andrew Golter, Gerald Gilbert, Matt Eichenfield, Dirk Englund. "Piezoelectric control of spin quantum memories in a cryogenic programmable photonic circuit platform." In CLEO: QELS\_Fundamental Science, pp. FTh4M.5, Optical Society of America. (2022)
- [4]. Mark Dong, Kevin Palm, Genevieve Clark, D. Andrew Golter, Kevin C. Chen, **Linsen Li**, Andrew J. Leenheer, Daniel Dominguez, Matthew Zimmermann, David Heim, Alex Witte, Gerald Gilbert, Matt Eichenfield, and Dirk Englund. "8-Channel quantum photonic network switch." In CLEO: QELS\_Fundamental Science, pp. FF3K.3, Optical Society of America. (2022)
- [5]. D. Andrew Golter, Genevieve Clark, Tareq El Dandachi, Stefan Krastanov, Matthew Zimmermann, Andrew Greenspon, Noel Wan, Hamza Raniwala, Kevin Chen, **Linsen Li**, Andrew Leenheer, Mark Dong, Gerald Gilbert, Matt Eichenfield, and Dirk R. Englund. "Scalable control of spin quantum memories in a photonic integrated circuit." In CLEO: QELS\_Fundamental Science, pp. FTh5L.3, Optical Society of America. (2022)
- [6]. Ching-Hua Wang, Victoria Chen, Connor J. McClellan, Alvin Tang, Sam Vaziri, **Linsen Li**, Michelle E. Chen, Eric Pop, and H-S. Philip Wong, "Ultrathin three-monolayer tunneling memory selectors," ACS Nano 15(5), 8484–8491 (2021).
- [7]. Jianfeng Jiang, Jingxin Li, Yutao Li, Jiazhzhi Duan, **Linsen Li**, Ye Tian, Zhihua Zong, Haotian Zheng, Xianjin Feng, Qiqiang Li, Hong Liu, Yu Zhang, Tian-Ling Ren, Lin Han. "Stable InSe transistors with high-field effect mobility for reliable nerve signal sensing. " npj 2D Materials and Applications 3, 29. (2019)
- [8]. Jiadong Yu, Zhibiao Hao, **Linsen Li**, Lai Wang, Yi Luo, Jian Wang, C. Sun, Yanjun Han, Bing Xiong, and H. Li. "Influence of dislocation density on internal quantum efficiency of GaN-based semiconductors." AIP Advances 7, 035321. (2017)
- [9]. Keyu Ning, Houfang Liu, **Linsen Li**, Huanglong Li, Jiafeng Feng, Baishun Yang, Xiao Liu, Yuxing Li, Yanhui Chen, Hongxiang Wei, Xiufeng Han, Shengcheng Mao, Xixiang Zhang, Yi Yang, Tian-ling Ren. "Tailoring perpendicular magnetic anisotropy with graphene oxide membranes." RSC advances 7.83: 52938-52944. (2017)
- [10]. Keyu Ning, Houfang Liu, Zhenyi Ju, Chi Fang, Caihua Wan, Jinglei Cheng, Xiao Liu, **Linsen Li**, Jiafeng Feng, Hongxiang Wei, Xiufeng Han, Yi Yang, Tian-Ling Ren. "Magneto-seebeck effect in magnetic tunnel junctions with perpendicular anisotropy." AIP Advances 7, 015035. (2017)

## WORK & RESEARCH EXPERIENCE

Research Assistant, Department of Electrical Engineering and Computer Science, MIT, USA

Advisor: **Professor Dirk Englund (MIT Ph.D. Advisor)**

Sep 2019 – Now

*Scalable quantum information processing architecture using a programmable array of spin-photon interfaces*

- Build a scalable system that contains thousands of tunable diamond qubits for scalable quantum computing. (CLEO 2022)

- Realize the scalable heterogeneous integration between massive diamond quantum microchiplet (QMC) on TSMC control chip.

#### ***High-fidelity entanglement of remote quantum emitters in the diamond nanocavity***

- To build a high-fidelity entanglement between the remote color centers in the diamond nanocavity. Every diamond color center's wavelength and lifetime can be tuned to provide the indistinguishability of photons.
- Had successful diamond nanocavity fabrication. The single color center in a diamond nanocavity will be a diamond qubit.

#### ***High through-put diamond nanostructure fabrication with silicon hard mask***

- Develop the fabrication recipe of the diamond QMC using the silicon hard mask fabricated from the foundry Applied Nanotool. Utilized the high-quality Si mask for nanopattern to build a high through-put fabrication process for diamond.

#### ***Modular quantum memory with packaged efficient spin-photon interface***

- Develop the high efficiency hybrid integration strategy between the diamond QMC and the photonic integrated circuit. The photonic integrated circuit will be packaged with the fiber array for reliable spin-photon interfaces in the cryostat. *Quantum* 2.0 2022, *CLEO* 2022)
- Design the photonic integrated circuit with DC and RF control for the diamond QMC to hybrid integrated on.

***Field-based design of a resonant dielectric antenna for coherent spin-photon interfaces*** (Master thesis, first author paper in *Optics Express*, first author conference talk in *CLEO 2021*, *APS March Meeting 2020*)

Research Assistant, Department of Electrical Engineering and Computer Science, MIT, USA

Advisor: **Professor Long Ju**

Feb 2019 – Jun 2019

***Terahertz Spectrometer Based on Graphene Landau Level*** (Tsinghua Outstanding Diploma Thesis)

Research Assistant, Undergraduate Visiting Researcher Program, Department of Electrical Engineering, Stanford University, USA

Advisors: **Professor H.-S. Philip Wong**, **Professor Eric Pop**

Jul 2018 – Sep 2018

***First Principles Study of Memory Selectors using Heterojunctions of 2D Layered Materials & Selector Designed for Memory*** (first author conference oral talk in *International Electron Devices Meeting 2018*, co-author paper in *ACS Nano*)

Research Assistant, Department of Microelectronics, Tsinghua University, China

Advisor: **Professor Tian-Ling Ren**

Sep 2016 – Jun 2019

***Negative Capacitance Black Phosphorus Transistors with low SS*** (co-first author paper in *IEEE Electron Device Letters*)

***High-Quality Reconfigurable Black Phosphorus p-n Junctions*** (co-first author paper in *IEEE Transactions on Electron Devices*)

***Millimeter-Scale Nonlocal Photo-Sensing Based on Single-Crystal Perovskite Photodetector*** (co-first author paper in *iScience*)

Research Assistant, Department of Electrical Engineering, Tsinghua University, China

Advisor: **Professor Zhibiao Hao**

Sep 2015 – Jul 2017

***Influence of point defects & dislocation density on the properties of GaN-based materials by first principle study*** (first author paper in *Computation Material Science*, third author paper in *AIP advance*)

***Terahertz source based on graphene nanoribbon*** (first-author Chinese patent granted)

#### **SKILLS**

**Programming Languages:** C, C++, Matlab, Python, Verilog HDL, Verilog-A, Latex, Labview, Shell.

**Professional Software:** VASP, Quantum ATK, COMSOL Multiphysics, Multisim, HSpice, Lumerical, Material Studio, Solidworks, Cadence, Blender, AutoCad, Altium.

**Chip Tape-out Experience:** Taiwan Semiconductor Manufacturing Company (TSMC) (0.18um RF, High Voltage), Sandia Photonic Integrated Circuit platform, Applied Nanotools (ANT) NanoSOI platform.

**Electronics Lab Experience:** PCB design, Design and simulate RF components, Cryogenic electro-optical measurement including the I-V measurement, Arduino microcontroller for experiment control, Pulse blaster programming for pulse control in laser. RF signal generator signal. FPGA programming. Wire bonding. Semiconductor Analyzer. Server and cluster management. Supercomputing cluster usage for simulation.

**Mechanical and Optics Lab Experience:** 3D mechanical part design and machine, Photoluminescence, Confocal microscope setup, Spatial light modulator programming for optical field control. Photonics setup building. Fiber alignment and gluing for photonics

chip packaging. Transmission measurement of the photonic integrated circuit with two fiber setup. Photonics RF Packaging of the tape out chip. Using tungsten probe to pick and place transfer for hybrid integration. Using PDMS to transfer print for hybrid integration. SU8 mold lithography for PDMS microfluidics channel.

**Cleanroom Experiences:** Photolithography, Electron-beam lithography, Metal deposition, Metal liftoff, Dry and wet etching, (Metal-organic) chemical vapor deposition, Atomic layer deposition, Molecular beam epitaxy, X-ray diffraction analysis, Atomic force microscopy, Raman Spectrum, Scanning Electron Microscope, Transmission electron microscopes.