

Education

Chu Kochen Honors College, Zhejiang University

B.E.(Eng.) in Opto-Electronics Information Science and Engineering

Zhejiang, China

Sept 2020 - Present

- **GPA:** 3.96/4.00, 90.6/100 **Ranking:** 1/101
- **Core Scores:** Photonics (4.0), Physical Optics (4.0), Signals and Systems (4.0), Integrated Photonics Devices and Design (4.0), Quantum Information Fundamentals (4.0), Applied Optics (4.0), Object Oriented Programming (4.0)

Laboratory of Photonic Integrated Circuits and Quantum Measurements, EPFL

Full-time Exchange Researcher in Prof. Tobis.J.Kippenberg's Group

Lausanne, Switzerland

July 2023 - December 2023

Research Interest

My research interest surrounds **photonic integrated circuit design** and **optomechanics**, with a focus on **inverse design methodologies**, **optical frequency combs**, and **electrical-optical-mechanical interactions**.

Publication

- [1] **Y. Zhao**, J. Guo, G. Yang, ..., & D. Dai "High-performance and compact integrated photonic dichroic filters and triplexer realized by an efficient inverse design", *Opt. Lett.* 48, 4961-4964 (2023), doi: [10.1364/OL.501554](https://doi.org/10.1364/OL.501554). (**1st Author**)
- [2] **Y. Zhao**, J. Guo, L. Yu, ..., & D. Dai (2023, July). "Compact and Low Loss silicon-integrated polarization beam splitter developed by efficient semi-inverse design approach", In 2023 *Opto-Electronics and Communications Conference (OECC)* (pp. 1-3), IEEE, (2023), doi: [10.1109/OECC56963.2023.10209791](https://doi.org/10.1109/OECC56963.2023.10209791). (**1st Author**)
- [3] J. Guo, L. Yu, H. Xiang, **Y. Zhao**, C. Liu, & D. Dai, "Realization of advanced passive silicon photonic devices with subwavelength grating structures developed by efficient inverse design", *Advanced Photonics Nexus*, 2(2), 026005-026005 (2023), doi: [10.1117/1.APN.2.2.026005](https://doi.org/10.1117/1.APN.2.2.026005). (4th Author)
- [4] L. Yu, J. Guo, H. Xiang, C. Liu, **Y. Zhao**, & D. Dai, "High-performance 2×2 bent directional couplers designed with an efficient semi-inverse design method", in *Journal of Lightwave Technology*, (2023), doi: [10.1109/JLT.2023.3315214](https://doi.org/10.1109/JLT.2023.3315214). (5th Author)
- [5] L. Yu, J. Guo, H. Xiang, G. Yang, **Y. Zhao**, Y. Li, & D. Dai, "Ultra-compact and high-performance four-channel coarse wavelength-division (de)multiplexing filters based on cascaded Mach-Zehnder interferometers with Bezier-shape directional couplers", submitted to *Optics Express*, Oct. 2023. (5th Author)

Research Experience

Integrated Photonic Device Design | Zhejiang University

Advisor: Prof. Daoxin Dai, Vice Dean of the College of Optical Science and Engineering

Zhejiang, China

Sept 2021 - Present

Project I: Development and application of the inverse design to spectrally selective waveguides

- Designed and compared two high-performance dichroic filters of Y-Branch structure with and without sub-wavelength gratings (SWGs) using a high-efficiency semi-inverse design method.
- Improved performance by using flap-top (ELs < 0.5 dB, CTs < 10 dB, 1dB Bandwidth > 25 nm), small footprint ($2.5 \times 22 \text{ } \mu\text{m}^2$), and well-scalable dichroic-filters (60nm channel space) with at least 2-fold footprint.
- Developed a triplexer (1310/1490/1550 nm) with a compact footprint of $10.5 \times 117 \text{ } \mu\text{m}^2$ based on the dichroic filters, which had both a decent overall performance and compactness with at least 15-fold footprint and better overall performance.
- Proposed some methods such as adjusting device geometry definition and loss function definition to accelerate the implementation processes and achieve higher performance for the same structures.

Project II: Advanced passive silicon photonic devices with subwavelength-grating structures

- Proposed a high-efficiency semi-inverse design method for ultra-compact passive silicon photonic devices.
- Designed and simulated a 6-channel mode (de)multiplexer, a broadband 90°-hybrid, and a two-channel flat-top WDM (210 nm channel space) with ultra-compact footprints which performed well.
- Realized a compact ($1.6 \times 4.9 \text{ } \mu\text{m}^2$) and low loss (ELs < 0.61dB, ERs > 13.8 dB) silicon-integrated polarization beam splitter.
- Designed and developed *Klayout*-based optical mask layout software by scripting in a *Python* API.

Photonic Integrated Circuits Design | EPFL

Advisor: Prof. **Tobis J. Kippenberg**, Full Professor, LPQM

Lausanne, Switzerland

July 2023 - December 2023

Project I: Large Tolerance WDM devices design and tolerance analysis

- Simulated the directional couplers, tapered couplers and corresponding WDM (70nm channel spacing) devices, while also analyzing the tolerance of width, thickness, coupler length and arm difference.
- Achieved the high-tolerance WDM designs that are suitable for photo-lithographic processes of various thicknesses (200/400/700/800 nm) and different channel spacings (980/1550 nm and 1480/1550 nm).
- Integrated of the WDM devices into the first Erbium-Doped Waveguide Amplifier (EDFA) and Erbium-Doped Waveguide Laser (EDWL) device.

Project II: Simulation and Measuring the Brillouin Scattering in LNOI platform

- Simulated fully anisotropic including the moving boundary, photo-elastic, and piezo-electric effects for the Brillouin interaction with *COMSOL*.
- Designed special lithium niobate waveguide structures for the experiments to validate the simulation results.
- Designed and built the “double modulators” setup to measure the Brillouin gain.

Skills

- Engineering Applications:
 - Simulation Softwares: *Lumerical* FDTD, COMSOL, ZEMAX
 - Mask Layout Design: *Klayout* & Scripting API Python (build-in & gdsapy)
 - Engineering Drawing: Altium Designer, SolidWorks
- Programming Languages: C/C++, Python, MATLAB, Mathematica, MYSQL, LaTeX
- Programming Frame: PyTorch, Neural Network & Reinforcement Learning Architecture
- Operating System: Linux (Ubuntu), Windows Server, MacOS

Selected Honors and Rewards

- Chu Kochen Scholarship (Zhejiang University Highest Grade Scholarship, 12 among all students) 2023.10
- National Scholarship – highest honor for undergraduates in China, awarded to top 1% 2023.10 & 2022.10
- College Star of Optical Science and Engineering in 2022 (10/950) 2022.10
- Pilot Scholarship (sponsored by Chu Kochen Honors College, Top 1%) 2022.10
- Gold Medal in the 9-th International “Internet+” Innovation Entrepreneurship Competition 2022.08
- Second Prize in the Eastern Region of National University Students’ Opt-Sci-Tech Competition 2022.07
- Second Prize in Zhejiang University Intelligent Robot Creativity Competition 2022.03

Standardized Tests

TOEFL iBT 106/120 Reading: 29 Listening: 26 Speaking: 24 Writing: 27