

SUMMARY

Research Assistant and Ph.D. candidate (EE) with nearly 6 years of experience in optoelectronic device (III-V and SiPh) design with Lumerical **FEEM**, **COMSOL**, **HFSS** software. Deep understanding and hands on experience on **MEMS** package and **CMOS** fabrication process. Experienced programmer (**Python**, **MATLAB**, **C**) with expertise in hardware automation and testing. Self-motivated and analytical thinking researcher with over 18 published peer-reviewed papers and 7 patents.

EDUCATION

Clemson University, Ph.D., ECE Department

USTC, M.S., Laboratory for Precision Fabrication of Diffractive Optical Elements

WUT, B.S., Department of Science

Clemson, SC, 08/2023

Hefei, Anhui, 06/2017

Wuhan, Hubei, 06/2014

WORK EXPERIENCE

Research Assistant, 08/2017 - present (+5 years)

Project: Hybridly integrated semiconductor lasers and amplifiers on III-V/Si₃N₄ platform for beam combining

- Design the array waveguide grating (AWG) on Si₃N₄ platform with Lumerical FEEM and INTERCONNECT
- Develop and demonstrate two fabrication methods (self-aligned, dry etch) for ridge lasers and semiconductors optical amplifier
- Integrate the Si₃N₄ AWG with semiconductors optical amplifier (SOA) to realize the chip-scale multiple channel beam combining to reduce system cost, size, and power consumption

Project: Hook-shape semiconductor optical amplifier (HSSOA) based hybrid integration laser

- Propose and demonstrate HSSOA based unidirectional laser through III-V/Si₃N₄ integration
- Design the Euler bending to reduce the bending loss and maintain a small device footprint
- Fold the laser cavity to reduce the alignment complexity by one-side coupling.
- Design the Taiji ring resonator to realize the symmetry breaking inside hybrid cavity

Projects: High power triple-ridge waveguide (TRW) laser; Regrowth laser; Multiwavelength LiDAR platform; ...

- In charge of the regrowth laser fabrication and processing optimization
- Design the surface grating for the triple-bands (1, 1.3, and 1.55 μ m) wide-angle beam steering system
- Anticipate in developing a fully automated high-accuracy advanced packaging tool with finetech (Femto2)
- Incorporate with ficonTEC to design and develop a customized active-alignment processing (A300)

Internship: Thin-film lithium niobate (TFLN) Mach-Zehnder interferometer (MZI) design and optimization

- Design an integrated TNLN MZI modulator and optimize the modulation bandwidth with impedance matching and minimal RF loss in HFSS
- Optimize the modulation efficiency by adjusting the LN waveguide position through overlapping the electric field with optical modal profile in COMSOL

SKILLS

- Design: Optoelectronic device simulation (Lumerical, COMSOL, HFSS, MEEP), e.g., Single (array) ridge waveguide laser and SOA, AWG, Directional coupler, Multi-mode interferometer, Ring resonator; Layout/Mask design (Python scripting); Solidworks; Blender
- Fabrication: Evaporator; Nano-reflector; Profilometer; Mask Aligner; Stepper; EBL; LPCVD; PECVD; RIE/ICP etcher
- Package: Ball bonder; Die bonder; Wafer bonder
- Test: SEM; Semiconductor analyzer; Tunable laser; Oscilloscope; Spectrometer
- Programing languages: MATLAB, Python, C

JOURNAL

1. **Zeng, S.**, Zhao, X., Sweatt, L., Porter, C., & Zhu, L. (2023). Unidirectional hybrid diode laser through integration of hook-shaped traveling-wave semiconductor optical amplifier and Taiji ring resonator. *Optics Letters*. 48(5), 1132-1135.
2. Porter, C., **Zeng, S.**, Zhao, X., & Zhu, L. (2023) Hybrid Integrated Chip-Scale Laser Systems. *APL photonics*. (Revising)
3. **Zeng, S.**, Zhao, X., Zhu, Y., Sweatt, L., & Zhu, L. (2022). Watt-level beam combined diode laser systems in a chip-scale hybrid photonic platform. *Optics Express*, 30(13), 23815-23827.
4. Zhao, X., **Zeng, S.**, Sweatt, L., & Zhu, L. (2021). High-power single-mode triple-ridge waveguide semiconductor laser based on supersymmetry. *AIP Advances*, 11(9), 095216.
5. Zhu, Y., **Zeng, S.**, & Zhu, L. (2020). Optical beam steering by using tunable, narrow-linewidth butt-coupled hybrid lasers in a silicon nitride photonics platform. *Photonics Research*, 8(3), 375-380.