

EDUCATION**THE UNIVERSITY OF TEXAS AT AUSTIN**, Austin, TX**Doctor of Philosophy, Electrical Engineering**, August 2020

GPA: 3.93 / 4.0

Dissertation: *Mid-Infrared Type-I Laser Design using Molecular Beam Epitaxy***STANFORD UNIVERSITY**, Stanford, CA**Master of Science, Electrical Engineering**, June 2006

GPA: 3.61 / 4.0

ARIZONA STATE UNIVERSITY, BARRETT HONORS COLLEGE, Tempe, AZ**Bachelor of Science in Engineering, Electrical Engineering; Minor, Mathematics**, May 2004GPA: 3.93 / 4.0, *summa cum laude*Honors Thesis: *An Active Antenna for a General Coverage Receiver and the Use of Negative Impedance Converters to Improve Frequency Bandwidth***EXPERIENCE****THE UNIVERSITY OF TEXAS AT AUSTIN, MICROELECTRONICS RESEARCH CENTER (MRC)**, Austin, TX**Postdoctoral Fellow, Laboratory for Advanced Semiconductor Epitaxy (LASE)**

September 2020 – Present

◆ Research focus: developing the world's first type-I diode laser operating at wavelengths beyond 4 μm .

◆ Additional responsibilities:

- Upgrading an optical spectrometer data acquisition system.
- Mentorship and technical guidance of doctoral students in experimental methods.

Graduate Research Assistant, LASE

August 2012 – August 2020

◆ Major research accomplishments:

- Longest wavelength (3.62 μm) type-I diode laser with an Al-free active region.
- Demonstrations of photoluminescence from type-I semiconductor materials with peak wavelengths up to 4.2 μm .
- First epitaxial growth of GaInAsSbBi alloys, incorporating up to 3% Bi.
- First demonstration of room-temperature photoluminescence from GaInAsSbBi alloys.
- Demonstrations of high-quality, droplet-free GaInAsSbBi alloys on GaSb.
- Designed novel heterostructures for thermionic emission-based optical absorbing materials.

◆ Contributions to laboratory and facilities development:

- Operated and maintained two Gen. II molecular beam epitaxy (MBE) systems with associated laboratory equipment and electronics (bake-out station, vacuum pumps, residual gas analyzers, power supplies, PID controllers, etc.).
- Developed an ultra-high vacuum-compatible heated scraper for indium buildup exfoliation.
- Designed a shutter/bellows assembly method to prevent in-vacuum MBE shutter detachment.
- Designed and implemented a support assembly for in-glovebag repair and maintenance of MBE substrate manipulators.
- Designed and built a pump-probe optical transmission test bench with sub-picosecond resolution to measure carrier recombination lifetimes in semiconductors.
- Increased the test automation capability of the MRC Hall test bench.
- Repurposed an underused lab for a Fourier transform infrared spectroscopy (FTIR) and infrared microscope test station.

◆ Software tools and development:

- Self-consistent data analysis and fitting tool using Python that analyzes X-ray diffraction measurements of epitaxially-grown semiconductor crystals to determine the semiconductor alloys.
- Data analysis scripts to calculate and present performance metrics of laser devices and materials such as optical output and operating efficiency.
- Maintained and upgraded a web-based SQL database to record laboratory activity and track consumable supplies.

◆ Mentorship and professional development:

- Directed the work of eight individuals participating in NSF summer and semester research experiences.

MSS, INC., Nashville, TN**Research and Development Engineer**

January 2010 – August 2012

◆ Research and development:

- Designed, prototyped, and tested industrial-scale optical sensing equipment and object detection systems for automated recyclables sorting.
- Performed testing and troubleshooting of optical sensing systems used in materials identification and separation.
- Researched methods of glass identification and separation using ultraviolet fluorescence measurements.

◆ Product development and support:

- Interfaced with mechanical, electrical, and software engineers to design sorting systems for materials recovery facilities.
- Created quality control checklists for electronics production.
- Provided operations support for new and legacy equipment deployed in the field.

◆ Engineering design:

- Designed and tested CPLD-based data processing and handling sub-systems using Quartus FPGA Design.
- Created electrical schematics and PCB layouts using Altium Designer.
- Created and trained materials identification libraries from sampled data sets for a variety of input materials streams.
- Calibrated detection/decision thresholds for application-specific optimization of materials identification and sorting.

GENERAL DYNAMICS ADVANCED INFORMATION SYSTEMS, Scottsdale, AZ**Senior Engineer – Systems**

January 2007 – January 2010

- ◆ Optical characterization and measurement:
 - Supervised the General Dynamics Advanced Information Systems Photonics Laboratory and technical staff.
 - Measured transmission degradation in diffractive optics and polymer waveguides exposed to simulated space radiation.
 - Collaborated with external groups to perform radiation dose exposure tests on optical elements designed for space-based applications.
- ◆ Systems integration and development:
 - Collaborated with external teams to integrate photonics elements into a proposed space-based high-speed optical communications system.
 - Designed and executed regression testing of a GPS RF receiver module in development, and reported the results.
- ◆ Optical signal processing:
 - Created a LabVIEW GUI to control a high-speed optical data communications switch and signal processing test bed, reporting on operating metric such as link uptime, transmitted/received data, data rate, and bit error rates.
 - Simulated optical signal processing linearization techniques using oversampling methods.
- ◆ Member of the New Employee Engagement Committee.

Systems Engineer II (with General Dynamics C4 Systems)

November 2006 – January 2007

- ◆ Facilities development:
 - Supervised the General Dynamics C4 Systems Photonics Laboratory.
 - Managed a capital expenditures budget of \$7,000 per month to acquire equipment and expand lab testing capability.
- ◆ Systems integration:
 - Calculated link budgets and size, weight, and power (SWaP) for satellite-based optical communication systems.
 - Performed investigations of emerging photonics technology for high-speed optical communications.

STANFORD UNIVERSITY, Stanford, CA**Research Assistant, Center for Nonlinear Optical Materials**

April 2005 – October 2006

- ◆ Primary research efforts:
 - Performed experimental investigations on the operation of synchronously-pumped optical parametric oscillators.
 - Developed mathematical models and simulations of synchronously-pumped optical parametric oscillator characteristics using MATLAB.
- ◆ Other responsibilities:
 - Supervised the safe operation of a high-powered optical test bench for a photoacoustic imaging experiment.

GENERAL DYNAMICS C4 SYSTEMS, Gilbert, AZ**Electrical Engineering Intern (also with Spectrum Astro, Inc.)**

April 2003 – September 2004

- ◆ Engineering design and testing:
 - Maintained a LabVIEW test bench and wrote data analysis software using Perl and MATLAB for a space fuel cell research project.
 - Designed the Thermal Interface Board for the Fermi Gamma-ray Space Telescope using Mentor Graphics Design Architect.
- ◆ Engineering support:
 - Procured parts for satellite manufacturing based on engineer specifications.
 - Assisted the Lead Engineer for Command and Data Handling on the NFIRE satellite.

PROFESSIONAL AND TECHNICAL SKILLS

Laboratory experience: Optics and optoelectronics test and measure; molecular beam epitaxy; ultra-high vacuum equipment operation and maintenance (effusion cells, cryopumps, residual gas analyzers, etc.); electronic test bench (oscilloscope, function generator, power supplies, RF vector network analyzer, etc.); soldering and circuit assembly; nanofabrication and clean room techniques (photolithography, chemical vapor deposition, reactive ion etching, inductively-coupled plasma etching, electron beam metal evaporation, wire bonding, wet-bench, etc.); testing and analysis (photoluminescence, electroluminescence, X-ray diffractometry (XRD), reciprocal space mapping (RSM), transmission/reflection spectroscopy, Hall effect measurements, Fourier transform infrared (FTIR) spectroscopy, ellipsometry, optical microscopy, atomic force microscopy (AFM), scanning electron microscopy (SEM))

Technical software: MATLAB, Origin, NI LabVIEW, nextnano, Altium Designer, Quartus FPGA Design, Mathematica, Advanced Design System (ADS), Mentor Graphics Design Manager and Design Architect, MathCad, Visual C++

Programming languages: Perl, Python, C/C++, Altera HDL, VHDL, XML, HTML, PHP, SQL, CSS, JavaScript, SPICE

Other software: L^AT_EX, Microsoft Office Suite, Adobe Photoshop and Illustrator

AWARDS AND DISTINCTIONS

- ◆ Dr. Brooks Carlton Fowler Endowed Presidential Graduate Fellowship in Electrical and Computer Engineering, The University of Texas at Austin, awarded 2017–2020.
- ◆ Cockrell School of Engineering Doctoral Fellowship, The University of Texas at Austin, awarded 2012–2016.
- ◆ Licensed Amateur Radio Operator, Extra Class, awarded 2008.
- ◆ Engineering Dean's List, Arizona State University, awarded 2000–2004.
- ◆ Arizona State University Merit Scholarship, awarded 2000–2004.
- ◆ National Merit Finalist, awarded 2000.
- ◆ Eagle Scout, awarded 1999.