KIP GADDIS

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EDUCATION

Rochester Institute of Technology *Expected Graduation: 2027*

Bachelor of Science in Mechanical Engineering Technology

Relevant Coursework: Characterization of Metals & Non-Metallic Materials, Manufacturing Processes, Circuits I, Statics, Strength of Materials, Thermal Fluid Science, Mechanical Dynamics, Imaging Science Fundamentals

EXPERIENCE

RIT Nano Power Research Laboratories Rochester, NY

August 2025 – Present

Research Assistant — NASA NIAC Phase II: Radioisotope Thermoradiative Cell Power Generator

- Build and characterize thermoradiative cells for deep-space power source that generates electricity by radiating heat to the cold of space, in collaboration with NASA Glenn Research Center.
- Designed, and preformed thermal analysis of a cryogenic measurement system to test prototype devices at operating conditions (~575 K emitter, cryogenic detector, high vacuum).
  - Performed radiative heat transfer analysis to size measurement enclosure; specified dual-coating strategy (Acktar Ultra Black / gold plating) to maximize signal-to-noise ratio.
- Fabricated ring TLM test structures on n-GaSb via photolithography and e-beam evaporation; characterized ohmic contact stability through 400°C annealing across multiple metallization stacks (Ti/Pt/Ag, Pd/Ge/Pd, Ag).

RIT Semiconductor & Nanofabrication Laboratory Rochester, NY

January 2025 – August 2025

Process Engineering Intern

- Achieved >20% cycle-time reduction with <2% wafer non-uniformity by redesigning LPCVD wet-oxide and nitride recipes.
  - Modeled film growth via Deal–Grove and Arrhenius kinetics; tuned DCS/NH_3 flows, pressure, and axial temperature to equalize deposition rates across tube zones.
  - Mapped films with reflectometry and profilometry; iterated recipes from measured data.
- Installed a Varian 350D ion implanter from the ground up: traced wiring harnesses across three schematic variants, troubleshot relay logic, performed systematic bring-up, and optically aligned the beamline.

RIT Formula SAE Racing Rochester, NY

August 2022 – Present

Electronics Design & Test Engineer

- Lead electromagnetic interference (EMI) characterization and mitigation for a 600 VDC, 8 kHz PWM electric powertrain (AMK Racing Kit: 4× DD5-14 PMSM, KW26-S inverters); design PCBs and high-voltage harness routing.
  - Conducted near-field E-field probing using FFT spectral analysis at 8 kHz fundamental on phase cables, HV DC bus, and mu-metal-lined inverter enclosure; mapped spatial decay (−8.5 dB/inch, $R^2 = 0.97$) to set minimum HV/LV harness separation distances.
  - Identified cable-conducted common-mode currents at the inverter enclosure boundary, not radiated leakage through the housing, as the dominant EMI coupling mechanism causing CAN bus message dropouts and STM32 resets.
  - Designed a relay economizer to reduce current and increase efficiency after the high voltage isolation relay opens.
  - Designed a 24 V relay distribution board for inverter startup sequencing.

Aerodynamics Design Engineer

- Designed aerodynamic and structural components of the tri-element rear wing for a first-place-winning Formula SAE electric race car (F32), achieving more downforce with less drag than the previous generation.
  - Selected GOE 227, Be 122-155, and GOE 448 airfoil profiles for the primary, secondary, and tertiary elements; optimized slot gap, overlap, and AOA through iterative ANSYS Fluent CFD (k-ω SST) at 15–30 m/s.
  - Designed endplates with vortex-cancellation notch and swept edges to suppress tip vortices and high-pressure spillover; manufactured via water-jet TeXtreme spread-tow carbon sandwich panels.
  - Designed swan-neck mounts with topology optimization in ANSYS; added lateral struts after side-load FEA, achieving ~72% reduction in wing deformation under aero loads.

- Preformed wind-tunnel validation at Ford Wind Tunnel 8: used smoke wand, laser-sheet flow visualization, yarn tufts, and floor-mounted scales to measure downforce/drag and correlate CFD predictions to physical data.
- Managed design and fabrication of a CFD-validation device: custom pitot tube and wing element with integrated pressure taps for correlating simulated and measured pressure distributions.

PROJECTS

Vacuum Tube Headphone Amplifier

- Designed and built a stereo OTL cathode-follower headphone amplifier using 6922 dual-triode preamp, 6AS7 dual-triode output, dual 6Z4 rectifiers, and 6NO45 time-delay relay; delivers ~26 dB gain and ~210 mW into 300 Ω with <1 mVrms idle noise.
  - Consolidated dual Hammond power transformers (369AX + 167S6) into a single custom toroidal unit; replaced Hammond 193B filter choke with a MOSFET-based capacitance multiplier (IRFBC40) to reduce size and weight.
  - Designed relay sequencing logic with RC-delayed B+ turn-on (~22 s after heaters) to protect tubes; added NTC inrush limiting and corrected fuse placement in the mains path.
  - Built full schematic and PCB layout in KiCad 9 with custom DRC rules enforcing five net classes and IPC-2221B trace width/clearance calculations for high-voltage isolation.
  - Implemented low-noise layout: true star ground topology, short rectifier-to-reservoir loops, twisted heater runs, grid-stopper resistors, and HV snubber networks.

Gas Turbine Generator

- Designing and building a gas turbine generator from a repurposed automotive turbocharger with a fully automated combustion and speed-control system.
  - Developing fuel injection, ignition sequencing, and turbine speed regulation via closed-loop electronic control.

Linear Particle Accelerator

- Co-designing and constructing a linear particle accelerator for semiconductor material research.

Combustion Light Gas Gun & Schlieren Imaging

- Building a single-stage combustion light gas gun for hypervelocity impact and asteroid research, with plans to scale to a dual-stage configuration.
  - Developing a Schlieren imaging setup for visualizing shock structures during projectile testing.

Solid Fuel Rocket Motors

- Designed, built, and static-tested solid rocket motors using KNO_3/sucrose propellant formulations; characterized thrust curves and specific impulse from test stand data.

Camera Lucida

- Building an optical drawing aid that projects a scene onto paper below using a semi-reflective beam-splitter arrangement.

TECHNICAL PROFICIENCIES

Process Tools: Tystar Tytan 4600 LPCVD (nitride & oxide), plasma asher, plasma etcher, e-beam evaporator, photolithography, MOCVD/MOVPE (in training)
Metrology: Filmetrics F40 reflectometer, Rudolph Auto-EL IV ellipsometer, Woollam VASE spectroscopic ellipsometer
Machining: Manual lathe, manual mill
Software: SOLIDWORKS, ANSYS (CFD & FEA), KiCad 9 (schematic & PCB), Python (data analysis)

CERTIFICATIONS & AWARDS

UPWARDS for the Future Fellow (RIT – Tokyo Electron) — Selected for the U.S.–Japan semiconductor workforce and research network.
Certified SOLIDWORKS Associate (CSWA) — Demonstrated competency in mechanical design and parametric modeling.
ISO 6 / Class 1000 Cleanroom Certified — RIT Semiconductor & Nanofabrication Laboratory
SCBA Certified — High-hazard tool maintenance (ion implanter, MOCVD)
Bertha Perkins Frothingham Award for Excellence — Friends of the Windsor Public Library