

# James D. Rosenthal

+1.520.780.2868  
jamesdroenthal@gmail.com  
jdrosenthal.com

## Summary

I am a Ph.D. candidate in electrical engineering who will graduate in <1 year. My technical skills include analog, digital, and RF design (10 MHz to 30 GHz) at both a board and system level, along with embedded programming, scripting, and signal processing. I thrive working in interdisciplinary teams and have developed my skill set through 8+ years of academic and industry experience working on biomedical, consumer, and aerospace systems across the product life-cycle. I am a US citizen authorized to work in the US and am willing to re-locate and travel internationally as needed.

## Education

2018–Present **University of Washington**, *Ph.D. in Electrical & Computer Engineering*.

**Advisor:** Prof. Matthew S. Reynolds

**Dissertation:** The NeuroDisc: A Wireless Neural Recorder Leveraging Ultra-low-power Backscatter Communication. (J1-J3, C3-C8), NSF Graduate Research Fellowship

**GPA:** 3.94/4.00,

2016-2018 **University of Washington**, *Master's of Science in Electrical & Computer Engineering*.

**GPA:** 3.93/4.00

2008-2013 **University of Minnesota–Twin Cities**, *Bachelor's of Science in Electrical Engineering*.

**GPA:** 3.73/4.00

## Professional Experience

2019 **ViaSat** Tempe, AZ

RF Engineering Intern March - June

Intern in charge of design, simulation, testing, and analysis of RF sub-systems in a re-designed transmit-receive integrated assembly (TRIA) for use with the next-gen ViaSat-3 satellite constellation. Responsibilities included design and performance analysis of planar K-band (18-27 GHz) receiver single-ended-to-differential transformers, development of an automated test regiment to improve GPS alignment circuitry and reduce installation costs, and filter design for bias circuitry used with K-band transmit power amplifiers. Results were presented at the end of my internship to entire Tempe office (100+ people).

2017 **NASA Langley Research Center** Hampton, VA

Lead Electrical Engineering on the GPX-2 Small Satellite Mission June - August

Returned to full-time work at NASA for the summer after my first year of graduate school. I served as the Electrical Engineering Lead on the GPX-2 small satellite mission that intends to test low-cost, off-the-shelf differential-GPS receivers in space. I designed a six-layer, PC/104-form factor flight computer based on the STM32F4 ARM-Cortex-M4 MCU. Technical responsibilities included schematic design, board layout, fabrication, assembly, and bench-top validation. In addition, I worked with the GPX-2 team to formulate the concept of operations, mission requirements, as well as the assembly, integration, and test plan. GPX-2 is set to launch in 2021.

2013-2016 **NASA Langley Research Center** Hampton, VA

RaD-X Avionics Lead Engineer 2013-2016

I served as the Avionics Engineering Lead for the Radiation Dosimetry Experiment (RaD-X) high-altitude balloon experiment. This mission was designed to measure >24 hours of galactic cosmic ray and solar energetic particle data from the stratosphere above New Mexico. I led the design of the complete avionics payload for through mission concept, requirements, prototyping, design, fabrication, environmental testing, flight, and post-flight analysis and collaborated with a diverse set of teammates and stakeholders, including NASA's Science Mission Directorate and the FAA. The project resulted in critical science data that improves our ability to forecast radiation storms that could harm airline workers and passengers. It has resulted in >10 publications, including (C2) and a special edition AGU journal.

OAAN Avionics Lead Engineer 2015-2016

I served as the Avionics Engineering Lead for the On-orbit Autonomous Assembly of Nanosatellites (OAAN) project. OAAN's goal was to develop a nanosatellite bus and ground validation system using air-bearings to demonstrate novel, low-cost guidance, navigation, and control system for nanosatellite rendez-vous and docking. I led development of the complete avionics system for the nanosatellite bus in collaboration with a team at Cornell University.

Autonomy Incubator Hardware Engineer 2015-2016

I provided hardware design support for cutting-edge research on the integration of autonomous drones into the national airspace and the use of autonomous aerial drones for planetary exploration. Projects included the development of a semi-custom flight computer board based on the Intel Edison that could provide greater drone-drone communication capacity.

2013 **Synapse Product Development** Seattle, WA

Electrical Engineering Intern January - May

Design, fabrication, and testing of consumer electronics.

2012 **Airbus** Toulouse, France

Electrical Engineering Intern May - December

Research and development of a CDMA wireless modem implemented on FPGAs.

2011-2012 **University of Minnesota UAV Research Group** Minneapolis, MN

Research Assistant May '11 - May '12

Design, fabrication, and testing of sensors for drones. Flew specific flight patterns as the drone test pilot for research on controls and system identification.

2010 **University of Arizona Neurorobotics Laboratory** Tucson, AZ

Research Assistant May - August

Firmware and instrumentation engineer working on humanoid robots.

2009-2010 **University of Minnesota UAV Research Group** Minneapolis, MN

Research Assistant July '09 - May '10

Instrumentation engineer and flight test pilot of fixed-wing and rotary-wing research drones.

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## Grants & Scholarships

2019 **Bergstrom Award for Art & Science**, Co-Investigator

2018 **National Science Foundation Graduate Research Fellow** (NSF GRFP)

2018 **NASA Space Technology Research Fellowship** (declined for NSF GRFP)

- 2011 **Roger M. Nordby Engineering Scholarship**
- 2009 **New Look Laser Technologies Essay Scholarship Winner**
- 2008 **Academy of Model Aeronautics Student Achievement Scholarship**
- 2008-2012 **University of Minnesota *Gopher Gold* Scholarship**

## --- Honors

- 2019 **IEEE Wireless Sensor Networks Conference** Student Paper Award Finalist (C4 & C5)
- 2017 **NASA Group Achievement Award – Autonomy Incubator**
- 2016 **NASA Group Achievement Award – Radiation Dosimetry Experiment (C2)**

## --- Peer-Reviewed Publications (J–journal, C–conference)

- J3 **J. Rosenthal** and M.S. Reynolds, "A 1.0 Mbps 198 pJ/bit Bluetooth Low Energy (BLE) Compatible Single Sideband Backscatter Uplink for the NeuroDisc Brain-Computer Interface," *IEEE Trans. on Microwave Theory and Techniques*, 2019.
- J2 **J. Rosenthal**, A. Sharma, E. Kampianakis, M.S. Reynolds, "A 25 Mbps, 12.4 pJ/bit Backscatter Data Uplink for the NeuroDisc Brain Computer Interface," *IEEE Trans. on Biomedical Circuits and Systems*, 2019.
- J1 A. Sharma, E. Kampianakis, **J. Rosenthal**, A. Pike, A. Dadkhah, and M.S. Reynolds, "Wideband UHF DQPSK Backscatter Communications in Reverberant Cavity Animal Cage Environments," *IEEE Trans. on Antennas and Propagation*, 2019.
- C8 **J. Rosenthal** and M.S. Reynolds, "All-Digital Single Sideband (SSB) Bluetooth Low Energy (BLE) Backscatter with an Inductor-free, Digitally-Tuned Capacitance Modulator," *IEEE International Microwave Symposium*, To be presented in June 2020.
- C7 L. Arjona, **J. Rosenthal**, J.R. Smith, and C.T. Moritz, "High Performance Flexible Protocol for Backscattered-based Neural Implants," *ICEAA - IEEE Antennas and Propagation in Wireless Comms. Conference*, 2019.
- C6 **J. Rosenthal**, A. Pike, and M.S. Reynolds, "A 1 Mbps 158 pJ/bit Bluetooth Low Energy (BLE) Compatible Backscatter Communication Uplink for Wireless Neural Recording in an Animal Cage Environment," *IEEE Conference on RFID*, 2019.
- C5 **J. Rosenthal** and M.S. Reynolds, "A 158 pJ/bit 1.0 Mbps Bluetooth Low Energy (BLE) Compatible Backscatter Communication System for Wireless Sensing," *IEEE Topical Conference on Wireless Sensors and Sensor Networks (WiSNet)*, 2019.
- C4 A. Dadkhah, **J. Rosenthal**, and M.S. Reynolds, "ZeroScatter: Zero-Added-Component Backscatter Communication using Existing Digital I/O Pins," *IEEE Topical Conference on Wireless Sensors and Sensor Networks (WiSNet)*, 2019.
- C3 **J. Rosenthal**, A. Sharma, E. Kampianakis, and M.S. Reynolds, "A 6.25 Mbps, 12.4 pJ/bit DQPSK Backscatter Wireless Uplink for the NeuroDisc Brain-Computer Interface," *IEEE International Conference on Biomedical Circuits and Systems (BioCAS)*, 2018.
- C2 **J. Rosenthal**, B. Hayes, and C. Mertens. "A Silicon Micro Dosimeter for High-Altitude Measurements of Cosmic Radiation," *IEEE Aerospace Conference*, 2018.
- C1 J. Pei, L. Murchison, A. Ben Shabat, V. Stewart, **J. Rosenthal**, et al. "Ground Demonstration on the Autonomous Docking of Two 3U Cubesats using a Novel Permanent-Magnet Docking Mechanism." *AIAA Aerospace Sciences Meeting*, 2017.

## --- Posters, Presentations, and Demos

- Presentation "A 1 Mbps 158 pJ/bit Bluetooth Low Energy (BLE) Compatible Backscatter Communication Uplink for Wireless Neural Recording in an Animal Cage Environment," *IEEE Conference on RFID*, 2019.
- Presentation "A 158 pJ/bit 1.0 Mbps Bluetooth Low Energy (BLE) Compatible Backscatter Communication System for Wireless Sensing," *IEEE WiSNet*, 2019.
- + Poster
- Presentation "A 6.25 Mbps, 12.4 pJ/bit DQPSK Backscatter Wireless Uplink for the NeuroDisc Brain-Computer Interface." *IEEE BioCAS*, 2018.
- + Poster
- Presentation "A Silicon Micro Dosimeter for High-Altitude Measurements of Cosmic Radiation." *IEEE Aerospace Conference*, 2018.
- Poster "Fully Wireless Instrumentation for a Bi-Direction BCI," *NeuroFutures Conference*, 2018.
- Demo "IBPoet: An Interactive & Biosensitive Poetry Composition Device," in *ACM UbiComp Conference*, 2017.
- Poster "Aerodynamic Characterization of the Mini Ultra Stick Airframe." *National Conference for Undergraduate Research*, 2012.
- Demos *Numerous demos and informal presentations for fundraising, lab visitors, and outreach guests.*

## Student Mentoring

- Summer 2014 **NASA** Taylor Dayton, Grad Intern, *Additive Manufacturing for Nanosatellites*
- 2013-2015 **NASA** University of Virginia Small Satellite Team
- Summer 2015 **NASA** Renee Hernandez, Undergrad Intern, *Low-cost Total Ionizing Dose Sensing System*
- 2018-2019 **UW** Alexandra Pike, NSF Research Experience for Teachers, *Analysis of the Wireless Channel Inside a Metal Animal Cage* (J1, C6)
- 2018-2019 **UW** Anissa Dadkhah, UW Undergrad, *Analysis of the Wireless Channel Inside a Metal Animal Cage and ZeroScatter* (J1, C4, C6)
- 2019-Present **UW** Tyler Petrie, UW Undergrad, *Low-cost Receivers for Wireless Brain-Computer Interfaces*
- 2019-Present **UW** Sara Reyes, UW Undergrad, *Analysis of the Wireless Channel Inside a Metal Animal Cage*
- 2020-Present **UW** Tyan Trinh, UW Undergrad, *Bit and Packet Error Rate Measurements for the NeuroDisc Wireless Brain-Computer Interface*
- 2020-Present **UW** Anand Sekar, UW Undergrad, *Bi-Directional Communication Protocols for Wireless Brain-Computer Interfaces*

## Volunteering & Outreach

- 2018 **UW** *Summer Youth Electronics Design*, Instructor
- 2018 **UW** *GEARUP*, Outreach Presenter
- 2017-Present **UW** *Engineering Days*, Outreach Presenter
- 2018-Present **UW** *Graduate and Professional Student Senate*, Senator
- 2016-2018 **UW** *EE Graduate Student Association*, President
- 2017 **UW** *EE Soldering Workshop*, Instructor
- 2016-2018 **Washington State Opportunities Scholar Program**, Mentor
- 2016 **Big Brothers Big Sisters**, Mentor

- 2013-2016 **NASA HUNCH** Outreach Mentor, providing hands-on experience to students building space-flight hardware
- 2015 **NASA Virtual Career Fair**, Speaker
- 2018 **NASA RaD-X Outreach**, Presenter
- 2013-2016 **NASA Speaker's Bureau**, Volunteer speaker at local schools and libraries
- 2014-2016 **NASA College of William & Mary's Focus on the Future**, Volunteer speaker
- 2013 **International Rescue Committee, Refugee Resettlement**, Volunteer

## Training & Professional Development

- 2020 **UW Empowering Prevention & Inclusive Communities**
- 2020 **UW Center for Neurotechnology: Creating an Inclusive Culture**
- 2018 **UW Green Dot Bystander Training**
- 2014 **NASA Requirements Development & Management**
- 2014 **NASA Proposal Development**
- 2014 **NASA Project Cost & Schedule Management**
- 2014 **NASA Crucial Conversations: Tools for Talking When Stakes Are High**
- 2013 **NASA Altium Designer: Schematic & PCB Layout**

## Technical Experience

- Programming Matlab (proficient), Verilog, Embedded C (basic), Python (basic), BASH (basic)
- Software Altium Designer, Eagle CAD, LTSpice, HFSS, ADS, GNU Radio Companion, CST (basic)
- Protocols Bluetooth Low Energy, UART, SPI, I2C, CAN, USB
- Lab Proficient with circuit prototyping and debugging, Network Analyzers, Spectrum Analyzers,
- Equipment Oscilloscopes, Multimeters, Soldering (through-hole, surface-mount), Software-Defined Radios
- Testing Thermal Vacuum Chamber, Burn-in, Radiation Beam Calibration, IACUC-approved Animal
- Experience Testing

## Languages & Outside Interests

- English Native Speaker
- French Proficient
- Flying FAA Private Pilot Glider Certificate (Current)
- HAM Radio FCC Technician Class License (KK4VMN)