Charlie Sands

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EDUCATION

Olin College of Engineering, B.S. Electrical and Computer Engineering **December 2027**

- Relevant coursework: Multivariable Calculus, Linear Algebra, Sensing and Instrumentation, Electricity and Magnetism, Products and Markets, Systems Programming, Infrastructure Studies, Biomimicry

PROFESSIONAL WORK EXPERIENCE

RF Design Engineering Intern | Astranis Space Technologies Corp. **May 2025 – Present**

- Designed, manufactured and tested failure tolerant waveguide power combiner for Ka-band geostationary communications satellites, reaching over 90% power combining efficiency across a >1 GHz bandwidth
- Redesigned and reworked X-band up and down converters planned for use in software defined radio transmit and receive pipelines on geostationary communications satellites, reducing undesirable spur levels by over 80%
- Designed and built a software defined radio-based EMI/EMC calibrator for less than 10% the cost of commercial equipment that is used for device calibration prior to communications satellite compliance testing
- Profiled and troubleshooted a variety of different equipment from single MMICs to custom ground station hardware

Avionics Lead & RF Engineer | Olin College Rocketry **Sep 2024 – Present**

- Developed a long-range 4+ watt half-duplex L-band radio telemetry transceiver based on a custom RF topology
- Improved performance by replacing low-power 500-milliwatt COTS transceiver for new Pheonix VI rocket platform
- Working toward the team's ultimate launch goal to launch past the Kaman Line and reach space by 2028

Founder | SCKZ Diverse Enterprises LLC **Jul 2024 – Present**

- Developed an e-commerce venture selling pre-made backscatter radio hardware to hobbyists and researchers
- Performs electrical engineering contract work for other businesses

PERSONAL PROJECTS & RESEARCH

Wirelessly Powered Sensing Platform | *RF Engineering, Ansys EDT, C, SDR, PCB Design* **Sep 2024 – Present**

- Designed, simulated and manufactured the first passively powered sensing system energized by an S-band beacon, equipped with a microcomputer and sensors and capable of relaying information through backscatter communication
- Implemented systems allowing sensor data encoding on beacon sidebands for extremely low-power transmissions
- First author on a paper detailing the design and testing methodology, accepted for presentation at the *IEEE International Conference on Electromagnetics in Advanced Applications, 2025*
- *Potential use case*: extremely low power edge sensing, sensing in hostile environments, security monitoring

Automotive Predictive Maintenance | *Electrical Engineering, Algorithms, PCB Design, C, Python* **Jul 2023 – May 2024**

- Improved the safety and reliability of a passenger automobile with algorithms to preemptively detect powertrain faults
- Developed a custom AI algorithm to detect unnoticeable deviations from nominal powertrain performance
- Designed a cost-effective analysis platform based on the ESP-32 microprocessor to monitor system performance
- Reverse engineered CAN-based vehicle powertrain data to record current vehicle powertrain sensor readings
- Awarded a provisional patent covering certain aspects of the idea/design as well as multiple industrial awards
- *Potential use case*: industrial machinery reliability monitoring, consumer device safety monitoring

Microwave Radar System | *RF Engineering, Electrical Engineering, PCB Design, C, Python* **Sep 2022 – Jul 2023**

- Designed a S-band Frequency Modulated Continuous Wave radar system for detection and ranging of moving targets
- Manufactured and implemented custom RF PCBs to connect the COTS RF components that make up the radar
- Developed custom frontend and drivers in C and Python to interface analog radar electronics to modern Linux PCs
- *Potential use case*: long distance measurement, safety sensing systems, security monitoring

WiFi Tracking System | *Hardware Hacking, C, Python, Networking Topology* **Nov 2021 – Jan 2022**

- Physically exploited Cisco Meraki MR18 Wireless Access Points to implement cellphone tracking system
- Reprogrammed MR18 through the JTAG headers with OpenWRT firmware and developed python-based backend
- Implemented trilateration algorithm to determine position of personal mobile devices-based Wi-Fi signal strength
- *Potential use case*: disease spread monitoring, retail point of interest detection, security monitoring

Extended Portfolio | My full portfolio is available at: www.sckz.org/portfolio

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Open Source

Ahkab | *A SPICE-like electronic circuit simulator; Written in Python*
- Modernized the Python 3 API calls of the project to allow continued support for the most recent Python versions

Linux Kernel | *The most popular operating system worldwide; Written in C*
- Improved memory safety and security of pre-packaged USB WiFi drivers in the Kernel

Ghidra | *An executable analysis tool from the NSA; Written in Java*
- Rectified errors in C parsing system for code decompilation and reconstruction

Alacritty | *A GPU accelerated terminal emulator; Written in Rust*
- Improved clarity of documentation for compilation and build procedures

Skills

- **Electrical:** *KiCAD*, *LTSpice, Altium, Keysight ADS, Ansys EDT*, Mixed Signal Design, RF Design, Oscilloscope, Spectrum Analyzer, VNA
- **Software:** C, C++, Java, Python, BASH, *MATLAB*, *Git*, *GNURadio*, SDR Platforms, Linux Kernel
- **Mechanical:** *SolidWorks*, *Ansys Thermal*, Tormach CNC, Manual Mill, Manual Lathe, 3D Printing, Laser Cutting

Awards & Recognition

- **Toyota R&D Innovation and Mobility Award:** Won for “MotorMinder” automotive predictive maintenance project
- **United States Office of Naval Research Naval Science Award:** Won for “MotorMinder” automotive predictive maintenance project
- **Northville Public Schools Bond Author Committee**: Co-author of $135 million bond, funding improvements to STEM spaces across my local school district without increasing community taxes

Certifications

- **Federal Communications Commission Amateur Radio Licensee:** Technician Class Radio Operator