

AVALON MCFARLAND

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Experience

Senior Electrical Design Engineer, Analog/Mixed Signal

June 2024-Present

Stealth AI Ventures, DBA

- Designed novel digital communication bus prototype for low cost, high performance audio processing systems. Utilizes 74HC and 74LV CMOS technologies over costly and overkill FPGA digital systems. Features proprietary phase locked loop (PLL) and delay locked loop (DLL) design schemes..
- Key collaborator in product architecture (clock trees, power trees, etc.) and product scale-up planning. Board design owner (schematic and layout).

Electrical Design Engineer, System Architecture

May 2022-June 2024

Tesla Motors

- Hardware owner and board designer for “Universal Communication Kit” PCBA - created to offload costly communication chips (\$2-\$5/vehicle) from the product (high volume) to test equipment (low volume). Developed in close collaboration with the powertrain firmware team. 8-Layer PCBA features automotive ethernet communication to emulate product hardware in new vehicles and energy products; AMx64 processor and wireless network management MCUs for hardware-in-the-loop (HIL) testing. Proven and successful integration in over 15 battery electronic product line testers.
- Implemented a new Universal Battery Management System (BMS) tester design across all vehicle and energy products - a necessity to reduce expensive battery pack system manufacturing defects. Utilizes “Universal Communication Kit” PCBA. General-purpose architecture cut electrical design work (schematic & BOM) by over 80% on new designs.
- Led the Powerwall and Cybertruck high-volume production testers from hardware architecture to software validation. Created and standardized test specifications for EE designers, FW and SW developers; worked to get cross-disciplinary buy-off using highly detailed block diagrams and system requirements.
- Mentored interns and technicians to build benchtop validation testers and various proto-boards for signal generation, temp & humidity sensing and a modular, remote-controlled 200W E-Load system.

Electrical Engineer

August 2020-April 2022

Multibeam Corporation

- Owner of the precision high voltage (HV) power supply and control system for the electron beam lithography tool. Built and designed electronics that monitor and control precision HV elements that shape and collimate particle beams. Experience with voltages up to 10kV.
- Designed, tested, and integrated custom HV PCBs and interconnects for precision high voltage meters, high voltage power supply control boards, and opto-isolated modems. Performed HV lab tests using custom test jigs to create high voltage design rules, specifications, and test procedures for specific high voltage geometries at atmosphere and ultra-high vacuum.
- Day-to-day activities include lab prototyping and experiments, creating system diagrams, schematic building, parts selection, BOM management, working closely with PCB layout and fabrication vendors, and exhaustive unit/integration testing.
- Designed and tested custom analog and digital opto-isolated systems. Digital circuits include 1MHz SPI photodiode amplifiers. Analog systems include pulse amplitude modulated (PAM) Modem (Modulator-Demodulator) prototype with an Automatic Gain Control front end that compensates for minor changes to the incident angles in the optical bridge.

Research Assistant

June 2019-July 2020

National Institute of Standards and Technology, Time & Frequency Division

- Development of the NIST F-3 Cesium Fountain Atomic Clock including a complete setup of remote system monitoring through internal TCP/IP networking on Linux based systems, improving custom optical shutter electronics using a TI microcontroller and a common drain amplifier, programming & testing atom detection systems, and vacuum assembly.
- Automated time dissemination analysis using Python scripts to read in, analyze & automatically generate reports of the phase & frequency shifts to coordinate a real time realization of UTC(NIST) across the time scale.
- Completed the environmental monitoring system for the Boulder portion of the official global time scale by calibrating & integrating PIC microcontroller sensors in hydrogen maser chamber network; used Slack APIs to create a bot that notifies group members of out of bound variations.

Teaching Assistant August

2017-May 2018

University of Colorado Boulder, Physics Department

- Tutored students in office hours and weekly recitations in Classical Mechanics for Physics Majors & Experimental Physics I
- Formally trained by the CU Boulder School of Education in effective STEM pedagogical techniques

Education

BS Electrical Engineering, Minor in Geology

May 2020

University of Colorado at Boulder

Hong Kong City University (Exchange Program)

Fall 2018

Technical Skills

PCB Schematic and Layout DFM (Altium, Cadence OrCAD, Allegro), LT SPICE simulation modeling, C/C++, Python, Go, Linux, Raspberry Pi 4B, Debian OS, Silicon Labs EFM32 Pearl Gecko Microcontroller, TI LaunchPad, Arduino, Prototype soldering and breadboarding, debugging, Altera FPGA, Verilog, Xilinx PYNQ, Red Pitaya, AutoCAD Electrical, PTC Creo, ArcGIS, ENVI, Petrel, PLM Software (ENOVIA, Windchill), Microsoft Excel, VBA, Git, MATLAB, LaTeX, Agile, Scrum, OpenGL, Microsoft Visual Studio, Zemax Optic Studio