Matthew R. Cummings

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Summary:

Over 15 years of experience as a consultant, project leader and electronic design engineer specializing in precision instrumentation and control systems. Broad technical skill set includes radio-frequency circuits, precision analog design, high-speed data conversion, power electronics, electrical product safety, embedded control, microcontrollers, firmware, software and programmable logic.

Experience:

Cummings Electronics Laboratories, Inc. *(Technical consulting)* North Andover, MA
Principal, 1990 to Present

Founded and operated a technical consulting practice and prototype manufacturing service specializing in precision instrumentation and control systems. Specified and developed system-level architectures for scientific, industrial and medical equipment. Designed low-noise, precision circuitry to operate in electrically noisy environments. Designed, marketed and manufactured a range of custom high-voltage power supplies, modulators and other components for pulsed and continuous wave radio frequency (RF) sources.

Recent work for our client base has included:

- Product specification and system architecture for a multichannel RF transceiver and waveform generator system used in a 1.5 Tesla MRI scanner. Worked with senior management to create a project plan consistent with the company's business goals and FDA QSR design controls. Hired staff, managed execution of the project plan and provided technical leadership for the program. Coordinated design and risk management reviews. Contributed on an individual level as an electronic design engineer with an emphasis on the RF, analog and embedded control aspects of the system.

- Design of instrumentation for capillary electrophoresis and laser-induced fluorescence analytic devices. Specified, procured and integrated lasers, optics, high-voltage power supplies and photodetection electronics. Constructed prototypes and created Labview-based user interfaces.

- Design and manufacture of a prototype 40-channel modular RF frequency converter system for use in a medical imaging data acquisition system. The system is a critical component in a leading-edge research MRI system being designed by a Fortune 500 medical device manufacturer.

- Program management and design of a precision 2.5 kW pulsed RF signal source for calibration of L-band (1 GHz) radar test equipment. Participated in all aspects of this $12M government contract, including the development of the winning technical and cost proposals. Technical contributions included system architecture along with board-level analog/RF and instrumentation designs. Managerial responsibilities included design staff coordination, interfacing with customer personnel and budget/schedule tracking.

- Design and manufacture of a 10 kW RF signal generator for a component testing application. Included in the design was a 2 kW, 6 kV high-voltage power supply based on a full-bridge MOSFET inverter.

Experience, continued:

ONI, Incorporated *(Medical imaging equipment start-up)* North Andover, MA
Senior Electrical Engineer, 1997-2001

Served as lead engineer in the development of high-performance electronic equipment used in a first-of-a-kind magnetic resonance imaging system specifically designed for imaging human extremities. Responsible for many aspects of the electronic design, including: system architecture, specification, detailed design, prototype development, test plans/procedures and regulatory compliance testing. The product was successfully introduced in the market after completion of the 3-year development. See www.onicorp.com

In addition to engineering tasks, played a key role in the company's development and growth. Developed policies and procedures consistent with the ISO9001 and the FDA's Quality System Regulations. Designed and implemented engineering and manufacturing databases using Microsoft Access. Set up and maintained the company's information systems, e-mail, web site and LAN.

Advanced NMR Systems, Inc. *(Manufacturer of medical imaging equipment)* Wilmington, MA
Senior Electrical Engineer, 1993-1995
RF Systems Engineer, 1988-1990

Designed and implemented electronic hardware for medical imaging equipment. Conducted research on improved radio-frequency shielding and gradient power sources used in magnetic resonance imaging applications. Participated in successful patent applications. Initiated and implemented design control procedures for engineering development. Developed subsystems for an upgrade package to the market-leading magnetic resonance scanner. Projects included:

- Fast, precise data acquisition module (1MHz, 14 bit)
- High performance quadrature RF receiver and signal processing
- Gradient power supplies up to 250 Amps/1600 Volts
- NMR RF coils and shields

Lucas Epsco, Inc. *(Electronic instruments for communications and test)* Hopkinton, MA
Senior Electrical Engineer, 1990-1993
Electrical Design Engineer, 1984-1988

Applied a broad range of disciplines in the development of high-power radio frequency test instruments and communication equipment for commercial and military applications, including:

- Microcontroller-based systems for precision motion control of rotating waveguide components used in radar and communication systems.
- Low-cost satellite communications terminal (VSAT) operating at Ku band (14-14.5 GHz). Developed system architecture, including a novel and cost-effective frequency conversion plan. Designed RF signal processing circuits.
- High-power pulsed RF sources, up to 75kW peak RF power at frequencies ranging from 1 to 14 GHz. Provided technical support and product improvement for the company's standard line of high-power instruments.

Education:

Babson College, May 2000 — Wellesley, MA
Master of Business Administration, Summa Cum Laude
Concentration – Entrepreneurship
Awarded 1992 Babson Scholarship

Worcester Polytechnic Institute, May 1987 — Worcester, MA
Master of Science, Electrical Engineering
Thesis – "Modeling and Analysis of a High-Voltage Power Converter"
Awarded 1985 WPI Presidential Scholarship

Worcester Polytechnic Institute, May 1984 — Worcester, MA
Bachelor of Science, Electrical Engineering, High Distinction

Skill Keywords:

RF design, power electronics design, power supply design, high-voltage design, precision analog design, A-D conversion, D-A conversion, data acquisition, embedded control, microcontrollers, signal processing, CPLD, FPGA, electrical safety, operational amplifiers, DDS, ADC, DAC, DSP, analog/RF filters, RF amplifiers, ISO9001, FDA QSR

Viewlogic, Orcad, Quicklogic, Altera, Motorola HC11, Intel 8051, Visual C++, assembly language, Microsoft Office, Autocad, Mathcad, Matlab

Affiliations:

Member, Institute of Electrical and Electronics Engineers
Member, Tau Beta Pi, Eta Kappa Nu and Golden Key Honor Societies