LT Wurtz, Ph.D.
Senior RF Electrical Engineer

108 Imogene Way
Madison, Alabama 35758
Cell: (205) 344-1997
Email: lwurtz@custommicroelectronicsystems.com
Email: lwurtz100@gmail.com
Website: https://www.custommicroelectronicsystems.com

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2004


2020

RESEARCH/DESIGN INTERESTS

RF/microwave/analog/digital electronic circuit and system design, Communication/radar/telemetry/GNSS system hardware, firmware, and software design, Communication/DSP algorithm development

EDUCATION

Doctor of Philosophy in Electrical Engineering, Auburn University, Auburn, Alabama, 1988.

Master of Science in Electrical Engineering, Auburn University, Auburn, Alabama, 1985.

Master of Science in Computer and Information Science, Troy University, Montgomery, Alabama, 1982.

Bachelor of Science in Computer and Information Science, Troy University, Troy, Alabama, 1979.

Bachelor of Science in Mathematics, Troy University, Troy, Alabama, 1979.

DOD Security Level: Yes - level on request

HANDS-ON EXPERIENCE

Radar hardware, firmware, and software design (2018 - 2024)
GPS and Galileo GNSS IF receiver, algorithm, and firmware development (2020 - 2024)
RF/Microwave electronics, circuit, and system design (1988 - 2024)
Analog and digital instrumentation circuit and system design (1983 - 2024)
Communication circuit and system design (1994 – 2024)
Software defined radio / DSP based system design (2013 - 2024)
Microprocessor, CPLD, and FPGA based system design (1983 - 2024)
Fiber-optic delay line and Optoelectronic system design (1994 - 2024)
Telemetry system design (1995 - 2021)
Data image processing using 2D / 3D visualization techniques (2007 – 2024)
Software experience: Visual C#, Visual C++/CLI, Visual Basic .NET, DirectX 3D Applications, Visual Fortran, numerous assemblers, Microsoft Office products, Autocad, Adobe Products, Altera Quartus Verilog FPGA design software, PCAD PCB design tools, Mentor Graphics DXDesigner/PADs Professional PCB design tools, SPICE, Genesys RF/microwave simulation tools, Matlab, Xilinx Vivado VHDL FPGA design software, Altium Designer PCB design tools, SONET EM Simulation Software, Mentor Graphics Hyperlynx

EMPLOYMENT EXPERIENCE

Senior RF Electrical Engineer, Qualis Corporation, Huntsville, Alabama, 2021 – present.
GNSS subject matter expert, Software Defined Radio hardware, algorithm, and firmware development, RF link analysis simulation development, RF/microware/digital hardware development, and all aspects of communication system hardware, firmware, and DSP-based algorithm design, Ka-band (29 to 36 GHz) weather radar/SATCOM receiver hardware and firmware design for the International Space Station. Phased Array antenna design. All aspects of hardware, firmware, and software design of a GPS disciplined, phase coherent, image rejection X/Ka-band and GNSS superheterodyne receiver for the International Space Station have been completed.

Senior Principal Electrical Engineer, Dynetics Aviation Division, Huntsville, Alabama, 2018 – 2021.
Support the Avionics Products Technology Department in the areas of hardware design, algorithm development, and advanced technologies. Some specific design tasks include:

new Enhanced Flight Termination Receiver hardware, firmware, and software design, numerous telemetry packages including the Raytheon Precision Strike Missile (PrSM) Flight Termination and Telemetry Kit with Hyperlynx performance studies, GNSS hardware and software defined receiver, tempest encryption design, and phased array antenna design.

Senior Design Engineer, KBM, Inc., Huntsville, Alabama, 2016 – present, (Consulting position)
Responsible for the design of a programmable X-band fiber-optic delay line for the AMRDEC-MSS2 Facility called the "Advanced CORFM" and an assortment of additional X-band and Ka-band RF/Microwave, analog, digital, PCB design, and C# programming projects. An additional interesting task included the design of a S-parameter based test procedure for Ka-band orthomode transducers.

Summer of 2007 joined a small engineering design group within the Redstone Test Command, Redstone Arsenal, Alabama called "Special Projects". The following three employers provided a contract funding vehicle over different time periods for the same RTC position.

Senior Design Engineer, Torch Technologies, Inc., Huntsville, Alabama, 2015 – 2018.
Responsible for the design and test of aircraft electronic subsystems and heavy vehicle CAN-bus cryptography. Responsible for the design and test of hardware/software systems for the Common Missile Warning System, CMWS, CIRCM Pointer Tracker, and Advanced Threat Warning System, ATW. Design of a ground-based telemetry and RF surveillance van for UHF, L, C, and S-bands.

Senior Design Engineer, AI Signal Research, Inc., Huntsville, Alabama, 2013 – 2015.
Responsible for the design and test of a performance reporting system for the Common Missile Warning System, CMWS, and Apache Ku-band CDL communications and RF system. Design of a ground-based telemetry and RF surveillance van for UHF, L, C, and S-bands.

Principle Research Scientist, Level 5, University of Alabama, Huntsville, Alabama, 2008 – 2013 (Retired, 34 years and 2 months of service).
Responsible for the design and test of a performance reporting system for the Common Missile Warning System, CMWS. Provided design support for an Apache ground-based communications system. Design and test of numerous instrumentation and telemetry systems. Design of a custom high-rate video and telemetry recorder for aircraft warning systems.

Principle Research Scientist, Level 4, University of Alabama, Huntsville, Alabama, 2007 – 2008.
Responsible for the design and test of a performance reporting system for the Common Missile Warning System, CMWS. Design and test of numerous

instrumentation and telemetry systems. Design of a custom high-rate video and telemetry recorder for aircraft warning systems.

Associate Professor, The University of Alabama, Electrical and Computer Engineering Department, Tuscaloosa, Alabama, Tenured, 1994-2007.
Responsible for teaching and conducting research in the areas of RF/microwave electronics, analog electronics, analog and digital IC design, control systems, and computer system design. Provided hardware/software engineering consulting services for a number of AMRDEC tasks, Redstone Arsenal, Alabama.

President, Custom Microelectronic Systems, Inc., Tuscaloosa, Alabama, 1994-2007.
Specialization in the research and design of prototype analog, RF/microwave, and digital microelectronic systems and fiber-optic based systems for military and commercial applications. High-performance, programmable optical delay lines built for Patriot Weapon System, White Sand Missile Range (many SBIR phase I and II contracts awarded with two taken to phase 3), Lockheed Martin, Boeing, Northrop Grumman Norden Systems, Naval Research Laboratory, and many others. Prototype phase shifters built for a Raytheon/TI early warning system. Design of prototype phased array telemetry receivers for military contractors. Design of a prototype S-band pseudo monostatic research radar supporting CW, doppler, FM chirp, and IQ waveforms.

Design Engineer, Redstone Technical Test Center, Redstone Arsenal, Alabama, May 1996-2009, (Consulting position)
Responsible for the design of high-performance analog and digital telemetry components and systems for the analysis of military weapon systems. Telemetry systems designed for the following systems: Stinger Block II, AGM 130, LCPK, BOAR, Digital Maverick.

Assistant Professor, The University of Alabama, Electrical Engineering Department, Tuscaloosa, Alabama, 1988-1994.
Responsible for teaching classes and conducting research in the areas of RF/Microwave electronics, analog electronics, analog and digital IC design, and computer system design. Established undergraduate and graduate classes and laboratories for analog and digital IC design and RF/Microwave electronics. Provided hardware/software engineering consulting services for a number of AMRDEC tasks, Redstone Arsenal, Alabama. Designed low-noise, radiation hardened sensors for the Superconducting Super Collider, Aachen University, Aachen, Germany.

Design Engineer, Countermeasures Engineering Company, Mesilla Park, New Mexico, 1991-1994, (Consulting position)
Research, design, and test of military fiber-optic based countermeasure systems and optical/digital RF memory systems. Designed the first optical based jammer for the Patriot System supporting the Survivability, Vulnerability, and Assessment Laboratory, White Sands Missile Range, NM.

Visiting Assistant Professor, Auburn University, Electrical Engineering Department, Auburn, Alabama, 1988.
Responsible for teaching electronics and computer system design classes for undergraduate and graduate students.

Graduate Teaching Assistant / Doctorial Student, Auburn University, Electrical Engineering Department, Auburn, Alabama, 1983-1987.
Responsible for teaching undergraduate electronics and computer system design classes and laboratories. Provided hardware/software consulting services for the Space Shuttle Block II main engine controller.

Computer Performance Analyst, Air Force Standard Systems Center, Montgomery, Alabama, 1979-1983.
Developed software monitors and performance reporting software for Honeywell computer systems. Many system workload and bottleneck studies were performed at Air Force installations.

PAPERS

J.E. Jackson, A.L. Highsmith, R.K. Pandey, and **L.T. Wurtz**, "Development of a Piezolelectric Driven Meso-Scale MEMS-Technology Gyroscope," Proceedings of the 17th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS 2004), Sept. 21-24, 2004, Long Beach, CA, pp. 845-851.

J.E. Jackson, A.L. Highsmith, R.K. Pandey, and **L.T. Wurtz**, "New Inertial Sensor for Aviation Navigation Application," Proceedings of the Fourth Integrated Communications, Navigation, and Surveillance (ICNS) Conference and Workshop, Fairfax, VA, April 26-30, 2004.

W. P. Wheless, Jr. and **L. T. Wurtz**, "A Near-Earth and Buried HF Antenna Computer Modeling Program," Proceedings of the 14th Annual Review of Progress in Applied Computational Electromagnetics, Monterey, CA, ACES Conference Publications no. 14, 16-20 March 98, pp. 1019-1027.

W. P. Wheless, Jr. and **L. T. Wurtz**, "Derived Distribution for Electrical Overstress Failure Thresholds of Transistors," Electronic Letters, Vol. 34, No. 21, 15 October 1998, pp. 2063-2064.

W. P. Wheless, Jr. and **L. T. Wurtz**, "Components of an Analytical Model for Snake Antennas," Applied Computational Electromagnetics Society Newsletter, Vol. 12, No. 2, ISSN: 1056-9170, July 1997, pp. 35-44.

W. P. Wheless, Jr. and **L. Wurtz**, "An Overview of Antenna Radiation Basic Principles," *Proceedings of the 13th Annual Review of Progress in Applied Computational*

Electromagnetics, Monterey, CA, ACES Conference Publications no. 13, 17-21 March 1997, pp. 256-261.

L. Wurtz, W. P. Wheless, Jr., and E. Bergsagel, "Design of a Programmable 2-18 GHz Microwave Fiber-optic Delay Line," *Proceedings of the IEEE Southeastcon '97*, Blacksburg, VA: IEEE Press, 97CH36044: 11-14 April 1997, pp. 11-19.

L. Wurtz, "Design of a Variable S-Band Fiber-Optic Delay Line," *Proceedings of the IEEE SoutheastCon '96*, Tampa, Florida, pp. 179-186, April 1996.

L. Wurtz, "GaAsFET and HEMT Small-Signal Parameter Extraction from Measured S-Parameters," *IEEE Transactions on Instrumentation and Measurement*, in Press.

P. Wheless and **L. Wurtz**, "Introducing Undergraduate Students to the Moment Method," *IEEE Transactions on Education*, in press.

P. Wheless, **L. Wurtz**, and J. Wells, "An Equivalent-Circuit Radiation Sensor Model," *Proceedings of the IEEE SoutheastCon '93*, Miami, Fl, pp. 7-11, April, 1994.

L. Wurtz and P. Wheless, "Design of a High-Performance, Low-Noise Charge Pre-Amplifier", *IEEE Transactions on Circuits and Systems*, in press.

L. Wurtz and P. Wheless, "Pulse Shaping in Low-Noise Charge Pre-Amplifiers", *IEEE Transactions on Instrumentation and Measurement*, Vol. 42, No. 5, October 1993.

L. Wurtz, "Design and Fabrication of a CMOS Signal Conversion Integrated Circuit for Remote Control Hobbyists", *IEEE Transactions on Education*, in press.

L. Wurtz, "An Efficient Scaling Procedure for Domino CMOS Logic," *IEEE Journal of Solid-State Circuits*, Vol. 28, No. 9, pp. 979-982, September 1993.

L. Wurtz, "Design of a Low-Noise, Radiation-Hardened Charge Pre-Amplifier," *Proceedings of the IEEE SoutheastCon '93*, Charlotte, NC, pp. 251-256, April 1993.

C. Cantrell and **L. Wurtz**, "A Parallel Bus Architecture for Artificial Neural Network Implementation", *Proceedings of the IEEE SoutheastCon '93*, Charlotte, NC, pp. 547-551, April, 1993.

L. Wurtz, "Built-In Self-Test Structure for Mixed-Mode Circuits", *IEEE Transactions on Instrumentation and Measurement*, Vol. 42, No. 1, pp. 25-29, February 1993.

G. Srikant and **L. Wurtz**, "A CMOS Parallel Gouraud Shading VLSI Architecture", *Proceedings of the IEEE SoutheastCon '92*, Birmingham, AL, April 1992.

D. Jackson, D. Whiteside, and **L. Wurtz**, "Exploiting Bit-Level Parallelism in Boolean Matrix Operations for Graph Analysis", *Proceedings of the IEEE SoutheastCon '92*, Birmingham, AL, April 1992.

L. Wurtz, "A Scaling Procedure for Domino CMOS Logic", *Proceedings of the IEEE SoutheastCon '92*, Birmingham, AL, April 1992.

L. Wurtz and D. DiBitonto, "Design of a Radiation-hardened, Low-noise, High-speed Charge Pre-amplifier for the Superconducting Super Collider", *Proceedings of the IEEE SoutheastCon '90*, New Orleans, LA, April 1990.

REPORTS/WHITE PAPERS

L. Wurtz and K. Whigham, "VUIT-2 AAG Cable and Omni Antenna Analysis," Redstone Test Center, Redstone Arsenal, Al, 4 May 2012.

L. Wurtz and K. Whigham, "Hostile Fire Detection by Mid-Wave IR," Redstone Test Center, Redstone Arsenal, Al, 25 May 2011.

L. Wurtz, "RTC/E3 CMWS Flare/Chaff Simulator Users Document," Redstone Test Center, Redstone Arsenal, Al, 3 August 2010.

L. Wurtz and K. Whigham, "OSC UV Scene Projector Analysis and Alternative Technologies," Redstone Test Center, Redstone Arsenal, Al, 10 September 2009.

L. Wurtz, "Design and Analysis of a 20 msec, X-band, Recirculating Fiber-Optic delay line", Contract Number: DAAL01-95-C-2015, Army Research Laboratory, White Sands Missile Range, New Mexico, February 1999.

L. Wurtz, "BAT-On-A-Rocket 'BOAR' Prototype Timing Sequencer Design Report", Redstone Technical Test Center, STERT-TE-F-TD, Redstone Arsenal, Ala, Contract No.: DAAL03-91-C-0034, TCN 96-126, 17 May 1996-15 August 1996.

L. Wurtz, "Final Report on the Design of a Prototype MMIC-based Delay Segment Microwave Subsystem for the VAL RGPO 1.5 GHz Fiber-Optic Delay Line Upgrade", Physical Science Laboratory, HIMADS ECM Group, New Mexico, July 1996.

L. Wurtz, "Programmable Microwave Fiber-optic Delay Line Network: SBIR Phase I Final Report", Contract Number: DAAL01-95-C-2015, Army Research Laboratory, White Sands Missile Range, New Mexico, September 1995.

L. Wurtz and K. Agar, "1.5 GHz Fiber Optic Delay Module (FODM) Prototype Final Report", Survivability/Lethality Analysis Directorate Electronic Warfare Division, ARL-CR-111, September 1994.

L. Wurtz and P. Wheless, "System Throughput and Architectural Analysis of the AAWS-M Enhanced Throughput Array Processor Assembly", BER Report No. 567-17, United States Army Missile Command, Redstone Arsenal, AL, May 1992.

L. Wurtz and P. Wheless, "Study of ASIC Test Methods for the Advanced Antitank Weapon System-Medium (AAWS-M)", BER Report No. 569-17, United States Army Missile Command, Redstone Arsenal, AL, June 1992.

L. Wurtz, P. Wheless, T. Seals, "Study of the AAWS-M ESAF, Block IIB Electronics Module", BER Report No. 556-17, United States Army Missile Command, Redstone Arsenal, AL, January 1992.

L. Wurtz, P. Wheless, T. Seals, "Study of the O/V Protection, Power-up Sequence, and Logic Array Power Regulator for the AAWS-M ESAF, Block IIB Electronics Module", BER Report No. 551-17, United States Army Missile Command, Redstone Arsenal, AL, October 1991.

L. Wurtz, W.P. Wheless, and K. Agar, "Digital and E-O RF Delay Techniques for Electronic Countermeasures", VAL-AD-TR-92-8, U.S. Army Vulnerability Assessment Laboratory, White Sands Missile Range, NM, December 1991.

L. Wurtz and J. Bredeson, "BIT/BITE Analysis Study Report for the Advanced Antitank Weapon System - Medium Command and Launch Unit", BER Report No. 537-17, U.S. Army Missile Command, Redstone Arsenal, AL, November 1989.

L. Wurtz, "Honeywell 6000 Timesharing Simulation Package", Air Force Data Systems Design Center, Directorate of ADPS Management, Montgomery, AL, February 1983.

L. Wurtz, "Honeywell 6000 Timesharing Terminal Scanner", Air Force Data Systems Design Center, Directorate of ADPS Management, Montgomery, AL, September 1982.

L. Wurtz, "Honeywell 6000 Utilization Reporting System", Air Force Data Systems Design Center, Directorate of ADPS Management, Montgomery, AL, October 1981.

L. Wurtz and D. Morris, "Computer Capacity Study of the USREDCOM and JDA H6000 Computer System", Air Force Data Systems Design Center, Directorate of ADPS Management, Montgomery, AL, June 1983.

L. Wurtz and W. May, "Computer Performance Evaluation of the H6000 Computer System ATC/AU", Air Force Data Systems Design Center, Directorate of ADPS Management, Montgomery, AL, March 1983.

M. Sutton and **L. Wurtz**, "Computer Performance Evaluation of the HQ AFCC H6000 Computer System", Air Force Data Systems Design Center, Directorate of ADPS Management, Montgomery, AL, April 1983.

HONORS

Service Recognition Award, The University of Alabama, Huntsville, Alabama, 2013
Army Research Laboratory SBIR phase III contract recognition, DAAL01-96-C-2003
Outstanding Electrical Engineering Instructor Award, The University of Alabama - 1989
Military Accommodation Award - 1983
Virgil L. Collins Mathematics Award - 1979
General Military Cadet of the Year - 1976
George C. Wallace Scholarship - 1975
4-Year Air Force ROTC Scholarship - 1975
Valedictorian Rehobeth High School - 1975

PROFESSIONAL ACTIVITIES

Member, IEEE

SEMINARS/SHORT COURSES PRESENTED

"Microcontroller-Based Digital System Design", The University of Alabama College of Continuing Studies, Kennedy Space Center / NASA, August 13-15, 1996, Cocoa Beach, Fl.

"Digital Systems Engineering", The University of Alabama College of Continuing Studies, Kennedy Space Center / NASA, July 25-28, 1995, Cocoa Beach, FL.

"Digital Systems Engineering", The University of Alabama College of Continuing Studies, Kennedy Space Center / NASA, April 24-27, 1995, Cocoa Beach, FL.

"Digital Systems Engineering for Non-specialists", The University of Alabama College of Continuing Studies, Kennedy Space Center / NASA, March 27-29, 1995, Cocoa Beach, FL.

"Digital Systems Engineering", The University of Alabama College of Continuing Studies, Kennedy Space Center / NASA, December 14-17, 1993, Cocoa Beach, FL.

"Applied Computer Architecture for Symbolic Processing and Artificial Intelligence," Auburn University Engineering Extension Service, Marshall Space Flight Center / NASA, 1984, Redstone Arsenal, Al.

PERSONAL

Marital Status:	single
Religious Preference:	Methodist
Height/Weight:	6' 2.5" / 240lbs
Military Service:	United States Air Force, Captain, Active Duty 1979-1983, Inactive Reserve 1983-1991
Hobbies:	RF/microwave/radar system design and communications/DSP firmware development

Sports: Distance walking and biking

Real Threat Emulator injecting INS, IMU, and UV Threat Profiles into an Apache AH64D Aircraft (Unclassified)