

RELEVANT ENGINEERING EXPERIENCE of MICHAEL E. GRUCHALLA, PE

Mr. Gruchalla is an electrical engineer with over 35 years international experience in the design, fabrication, project direction and implementation of high-performance electronic systems. He holds a Master of Science degree in Electrical Engineering, University of New Mexico and a Bachelor of Science degree in Electrical Engineering, University of Houston. He is a member of both Tau Beta Pi and Eta Kappa Nu engineering honor societies and is a licensed Professional Engineer of the state of Texas. He is a member of several IEEE committees and has published significantly in the field. Mr. Gruchalla holds several US and foreign patents in various technologies including RF amplifier designs, high-speed data acquisition, novel sensors and signal-processing and high-performance power distribution and grounding for instrumentation applications. Mr. Gruchalla has acted as a mentor for high-school students for almost his entire career. Mr. Gruchalla is also recognized as a professional mentor by both his peers and his customers, and is considered a subject-matter authority in analog design and instrumentation-system engineering.

Mr. Gruchalla's primary technical experience is in the design of high-performance analog systems. Mr. Gruchalla has designed and implemented systems for both terrestrial and space-borne applications including low earth orbit and deep space applications. He has designed and implemented sensors and systems to survive and operate in high ionizing-radiation environments, high-level CW electromagnetic environments (high-level EMI environments) and very high-level pulsed electromagnetic environments (high-level EMP and HPM environments). His design experience ranges from dc to beyond 20GHz in frequency and from extremely low-level, thermodynamic-noise-limited systems to very high-power linear amplifier systems capable of output levels in excess of 20kW peak. Mr. Gruchalla's most recent engineering experience includes:

- High-performance radiation-tolerant sensors and sensor-interface systems for linear-accelerator applications to effect such measurements as charged-particle-beam profile, beam halo, beam position, beam current, beam loss, etc.
 - Highly-optimized electronic interfacing of particle accelerator wire scanners for beam profile measurement.
 - Highly optimized electronic interfacing of particle-accelerator beam-current monitors.
 - Highly optimized electronic interfacing of radiation sensors – ionization chambers, GM, scintillation, etc.
- Very wide-dynamic-range, low-noise detection systems – >100dB dynamic range and thermodynamic-noise-limited sensitivity.
- High-performance, space-borne and terrestrial thermodynamic-noise-limited analog sensor interface systems for measurements including magnetic and electric fields, electric charge, current, physical position, velocity, angle and rate, mass, gravity, light, etc. and covering the frequency spectrum from DC to >20GHz.
- High-performance design and interfacing of exotic sensors including:
 - Inductosyn angular and linear position sensors.
 - Magnetohydrodynamic angular rate sensor (e.g., Kearfott ARS, ATA ARS) and solid-state rate sensors.
 - Flux-gate magnetometer sensors.
 - Charge-displacement charged-particle-beam profile and halo sensors.
 - Charged-particle-beam position and beam-current sensors.
 - Photonic sensors:
 - Avalanche photodiodes.
 - Very wide-bandwidth optical detectors.
 - Photomultipliers.
 - Micro-channel-plate electron multipliers and Micro-channel intensifiers.
 - Gen-1, Gen-2 and Gen-3 image intensifiers.
 - Focal-plane arrays.
- High-performance, compact, high-power, very high-efficiency, poly-phase, radiation-tolerant linear and SMPS motor drive systems for critical space-borne and terrestrial applications.
- High-performance grounding systems to minimize encroachment of nuisance noise into low-noise systems such as precision instrumentation and data-acquisition systems, and to minimize EMI radiation from critical systems.
- High-performance shielding systems to minimize both noise encroachment into and EMI radiation from critical analog and digital systems.
- Very wide-bandwidth streak-camera systems providing time resolutions of several femtoseconds.
- Very wide-bandwidth RF transformers including:
 - Very Wide-bandwidth, baluns – >22 octaves bandwidth to >20GHz.
 - Very Wide-bandwidth, low-loss RF transformers – 2:1 impedance ($\sqrt{2}$ voltage) and 3:1 impedance ($\sqrt{3}$ voltage) ratios, <1dB excess loss, unbalanced and balanced and >20 octaves bandwidth.
- Very low-noise, wide-bandwidth RF amplifiers covering bandwidths greater than 20 octaves and to >20GHz.
- High-power, wide-bandwidth RF amplifiers having power levels >20kW peak over bandwidths of >17 octaves.

Mr. Gruchalla's project lead, management and administrative experience includes:

- Extensive experience with Department of Energy and Department of Defense (United States Air Force) programs, standards, policies, operational procedures and resources in both weapons systems and research and development.
- Excellent communications skills – communicates easily and routinely with customers and with peers and team leaders with the ability to quickly understand complex requirements and acts as subject-matter expert to customers, peers, team leaders and leadership members to direct development of cost-effective, timely approaches to meeting the needs of complex, often arcane, mission requirements in both hardware and software systems.
- Extensive experience in system analysis and problem solving of mission-critical issues using very organized, detailed analytical approaches to all analyses applying extensive engineering and scientific experience and such formal tools as root-cause analysis, failure mode and effects analysis, mistake proofing, fault tolerance, etc., and the ability to distill findings, results and recommendations into well-organized, written reports accurately documenting the analyses.
- Extensive experience in mentoring customers and peers alike acting as coach to these individuals to guide them in developing greater understanding of fundamental engineering and physics principles, leading the team to apply these principles to satisfy specific mission requirements, and providing global task oversight to help individuals through particularly troublesome elements of their projects.
- Extensive experience working closely with customers as an industry subject-matter expert providing guidance in the development of products, procedures and policies, often acting as arbitrator to focus disparate opinions to a common goal, to help assure that the final product not only meets mission needs, but also is both feasible and cost effective.
- Extensive experience with military, space and industry standards to assure safety, quality and survivability of systems deployed both in public environments and adverse environments, such as deep space.
- Extensive experience in reviewing proposals, requests for proposals, specifications and other requirements documents and technical papers with the ability to understand the critical or difficult aspects of products or services requested or offered.

For additional information and references, Mr. Gruchalla's Curriculum Vitae will be provided upon request.

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