Kimberly Renee Alvarez

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RF MIC, IMA, MMIC Microwave Engineer
Profile Page

My experience is in MIC, IMA, MMIC technology utilizing discrete chip parts attached to a substrate with conductive epoxy and interconnected with 1 mil diameter gold wires. However, I also have experience with PCB assemblies where packaged components are soldered to the substrates. I have also worked with MMIC design. I am familiar with the Triquint 2MI amd 3MI MMIC design guidelines. I have a website. Go to **www.microwaveandrfconsulting.com** . I have an active DOD Secret security clearance.

The substrates that I've used include soft-board FR-4, Rogers Duroid boards of various types, and hard material, such as Alumina. The layers have ranged from single layer, up to 16 layers in LTCC. I use microstrip, stripline, coplanar, and discrete techniques in my circuits, depending on application. The structures include RF layers, control line signal layers, DC voltage power layers, and ground layers. My designs are functionally oriented, but I also include EMC layout techniques such as: best bypass and decoupling capacitor types and values to use based on the application, component self-resonance and board resonance, edge rate transitions, ground loops, crosstalk, partitioning, interconnects, layer jumping with internal vias, and power vs. ground plane fringing.

I can trouble-shoot microwave circuits and sub-systems. I can trouble-shoot EMC related problems in existing RF/microwave designs. I can provide in-depth interface services between a company and an LTCC foundry in the development of multilayer substrates.

I have designed sub-systems including up and down frequency converters, frequency sources, switching matrixes, amplifiers, oscillators, mixers, filters, etc. Some of these assemblies were hermetically sealed. MIC/IMA/MMIC assemblies are the most space-friendly type of hardware due to significantly reduced size and weight. I can design/analyze cascaded RF components for gain, power, noise figure, IP3, wide bandwidths, out of band signal rejection, harmonics, spurious signals, and DC voltage/current consumption. I've worked thick film, thin film, and LTCC technologies.

I have designed amplifiers (low noise, gain blocks, and power amplifiers) with inter-stage matching networks between transistors in multi-stage assemblies. My work has included GaAs, FETs, PHEMTs, and bipolar. I can design compensation networks to extend the frequency range and increase stability. I can include Drain-Gate feedback to extend the frequency range, and control the gain. I can place transistors directly in parallel to increase output power. I can design amplifiers in parallel configurations between langue couplers for increased output power. I perform stability circle analysis to ensure that there are no internal oscillations. I can design the bias circuits to provide stable turn-on and turn-off transitions. I use both DC-DC voltage converters and voltage regulators for best efficiency. All these techniques directly transfer to GaN technology. GaN delivers designs with lower current, lower junction temperatures, higher S11/S22 transistor reflection plane impedances, greater efficiencies, and smaller chip dimensions. GaN is the future of power amplifiers and I am part of that specialty.

I have designed negative resistance oscillators (VCO, CRO, and DRO). I've also designed frequency multipliers and comb generators (Step Recovery Diode or Schottky-barrier diode), mixers, limiters, attenuators, and filters. My filter design experience is in discrete lumped element, microstrip, and stripline. I have designed parallel edge-coupled filters, interdigital filters, hair pin filters, and comb-line filters. My experience includes Lowpass, highpass, bandpass, bandstop, and highpass/Lowpass diplexers in butterworth, Chebyscheff, or elliptic topologies. I've also designed power dividers/combiners, such as Wilkinson, Hybrid, Gecho, and Traveling Wave.

I've worked independently and also as a team member. I am prepared to be a team leader. I can write specifications and technical descriptions and analysis for proposal bidding. I led a cost reduction team of a Comb Generator, where I reduced the manufacturing costs from $650 to $37 per unit in transitioning from engineering to production.

I've worked at large and small military and commercial companies. The military companies pushed the technology envelope, while the commercial companies prioritized fast delivery and low cost. I am comfortable with both types of environments. My primary design tool is Microwave office (MWO), with which I am able to create the electrical schematic and the circuit layout in parallel. This eliminates the repeated back and forth repetition between MWO and a separate layout tool, thereby significantly reducing the design time. I own a copy of Microwave Office and Agilent Genesys RF Architect. I do whatever is required to meet schedules. I take ownership of my work, and always look forward to new challenges.

Other Skills: I've earned the Toastmasters "Competent Communicator" certificate. I am bilingual in English and Spanish.
Definitions: MIC (Microwave Integrated Circuit). IMA (Integrated Microwave Assembly). A MIC and an IMA are the same thing.

PROFESSIONAL EXPERIENCE:

I designed the following microwave circuits that were developed into production products:

Tampa Microwave Senior RF Engineer **October 2012 to September 2013**

I designed a Low Noise Amplifier and a Frequency Down-converter. I also tested the LNA & the FDC with microwave test equipment.

Raytheon Electronic Systems, Inc.Principal Electrical Engineer October 2000 to January 2012

- MIC/IMA 3 stage wide band balanced X band power amplifier with Ropt Copt power matching.
- MIC/IMA LNA: Two stage balanced KU band amplifier with 0.8 dB noise figure.
- Two wide band mixers:
  - MIC/IMA: Triple balanced mixer on suspended substrate. Including wide band baluns.
  - MMIC: Resistive FET mixer using Triquint 2MI (0.25 micron) process. Including wide band baluns.
- MIC/IMA Two SRD Comb Generators: 100 MHZ input with 20 output harmonics. 1 GHz input with 12 harmonics output.
- Several MIC/IMA multi-layer structures on LTCC substrates. Components were bare die connected by 1 mil wires.
- MIC/IMA Passive microwave circuits such as filters, couplers, power dividers, etc.
- I led a cost reduction team to reduce manufacturing costs of my Comb Generator from $650 to $37 per unit.

High Frequency Products, Inc. Consultant. March 2000 to Aug 2000

- Modified 12.3 GHz DRO oscillator. +17 dBm output, phase noise 110 dB/Hz @ 100 KHz carrier offset. This was a standard PCB surface mount design, intended for high volume production.
- Designed two DRO oscillators at 9 and 13 GHz. Both fixed frequency.

California Amplifier, Inc. Senior Engineer July 1999 to March 2000

- Two CRO (2.4 & 2.7 GHz) oscillators. SSB was -64 dBc/Hz @ 100 Hz, -69 dBc/Hz @ 1 KHz, -97 dBc/Hz @ 10 KHz, -110 dBc/Hz @ 100 KHz, & -120 dBc/Hz @ 1 MHz. These oscillators included output buffer amplifiers to reduce frequency pulling.
- Three frequency doublers @ 4.8, 5.4, & 10.8 GHz output. Several microwave amplifiers, and filters.
- Up/Down frequency converter portion of LMDS wireless Transceiver. I presented the design to the customer. We were awarded the contract.

QuinStar Technology, Inc. Consultant. March 1999 to July 1999

- Provided EM simulations of 40 GHz MEM switches and delay lines.
- Microstrip filters at 18, 21, & 38 GHz. Power dividers at 78 & 94 GHz. The power dividers were traveling wave structures.

Delphi Components, Inc. / Amplica, Inc, / Microwave dB, Inc. Engineer. November 1997 to March 1999

- Microstrip bandpass filter @ 20 GHz.
- Two VCO oscillators @ 900 MHz & 2.5 GHz, a 3.5 GHz LNA, and a diode limiter circuit.
- Dielectric resonator filter @ 30 GHz.
- Modified existing design: Deactivated input stage amp for ON-OFF channel switching with PIN diode, and improved stability.

SiRF Technology, Inc. Consultant, then Regular Employee as Senior RF Engineer. January 1997 to September 1997

- RF front end of 2.4 GHz wireless Transceiver (antenna filter, IF filter, LNA, & PA). Performed transmit & receive spur analysis.
- Portion of phase lock loop. Two pole op amp loop filter.
- Single ended and balanced filters.
- Four layer PCB assembly for all of the above circuits. Working breadboard produced in six months.
- Design support for GPS RF circuits.

ADDITIONAL RELEVENT PROFESSIONAL EXPERIENCE:

Northrup Grumman (formally TRW, Electronic Systems Group) Senior Staff Engineer. March 1979 to January 1997

- Two stage single ended FET 17 dB gain amp @ 15 GHz on alumina substrate.
- Two balanced FET amps (s band and X band) with Lange couplers.
- Lowpass, highpass, bandpass, band-reject, microstrip and stripline filters; and a highpass/Lowpass lumped element diplexer.
- Active filters.
- 8900 – 9660 MHz VCO (negative resistance type).
- Two stage Radar Transceiver (preamps, variable gain amps, VCO, linearizers, integrators, summers, differential and active filters.
- 20 GHz frequency doubler.
- Modified a DRO oscillator.
- 38 MHz VCXO for the PLUTO Satellite with a Q of 100,000 for very low phase noise.
- Two stage 24 watt SSPA using Fujitsu transistors for the ODYSSEY project.
- Pierce oscillator for the FORD/LINCOLN remote entry transmitter. Extremely high Q provided by SAW resonator.
- Several VCO oscillators (bipolar transistors in common base, common emitter, and common collector configurations).

EDUCATION: Bachelor of Science of Electrical Engineering. **West Coast University**
General School Number: 818-299-5500 Asst Registrar: Ana Linky 818-299-5516

- Seminar in nonlinear circuits that specialized in microwave mixer design. Instr: Dr. Stephen Maas.
- Raytheon in-house workshop in ADS. Agilent, Inc.
- Raytheon in-house workshop in HFSS. Ansoft, Inc.
- Wireless seminar workshop in class F microwave amplifier design techniques. Steve C. Cripps
- Workshop in multi-layer circuit board design techniques. Wireless Seminar
- TRW in-house class in RDE training.
- TRW in-house class in low noise amplifier design techniques. Les Besser
- TRW in-house class in MMIC design techniques.
- Two week workshop in Microwave antenna near-field measurement techniques. National Bureau of Standards.
- Additional Graduate Classes at California State University, Fullerton; and at the University of Southern California

PROFESSIONAL ASSOCIATIONS:
Senior Member: IEEE: Institute of Electrical and Electronics Engineers.
Senior Member: MTT: Microwave Theory & Techniques Group (Society within IEEE).
Member: IEEE National Consultants Network and LAACN (Los Angeles Area).
Member: Toastmasters International (Competent Communicator certificate).

PUBLICATIONS:

- AWARD: From U.S. Dept of Transportation for excellence in Transportation Research and Development, TRW RailSentry Team Member. 1996
- Wrote & presented paper at IEEE-MTT International Microwave Symposium. W Band Collision Avoidance Radar for Light Rail Applications. 1996
- Wrote & presented paper at MAES (Mexican American Engineering Society) Symposium: Subject: Voltage Controlled Oscillator Design at Microwave Frequencies. 1988

Wrote & Presented six papers at 2004, 2005, 2006 & 2008 Raytheon RF Symposiums:

- Future Fab-less Design Road Map of the Solid State Microwave Dept to Design & Manufacture Integrated Microwave Assemblies. 2008
- New MMIC Resistive FET Mixer Design. 2006
- Resistive FET Mixer. A state of the art mixer in a multi-function MMIC chip. 2005
- Comb Generator Design Approach enables 90% Cost Reduction by eliminating tuning. 2005
- Comb Generator Stability & Efficiency, "Microwave Office" used to design Comb Generator. 2004
- 3 Dimensional IMA Package Concepts for Volume & Weight Reductions that reduce System Costs. 2004

Owner of the following Software:

- Applied Wave Research Microwave Office.
- Agilent/Eagleware Genesys RF Architect**.**

Can also provide design and analysis with the following Software:

- Ansoft HFSS.
- Autodesk AutoCad.
- Microsoft Project Scheduler.

SECURITY CLEARENCES: Active DOD Secret.
Languages: I am bilingual in both English and Spanish.

RFERENCES: Supplied on Request.