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AREAS OF SPECIALIZATION

Low-noise, nonlinear, and large-signal RF/microwave circuits; computer-aided design of linear and nonlinear microwave circuits; intermodulation distortion, spurious responses, and related phenomena; nonlinear modeling of solid-state devices; microwave systems; mixers, power and low-noise amplifiers, frequency multipliers, microwave sources.

EDUCATION

3/84	Ph.D., Electrical Engineering, UCLA. Supported by a TRW Fellowship. Dissertation Title: *Theory of GaAs MESFET Mixers*.
12/72	MSEE, University of Pennsylvania, Electrical Engineering. Supported by a Ford Foundation Fellowship.
6/71	BSEE, University of Pennsylvania, Electrical Engineering.

EXPERIENCE

12/92 - present	Nonlinear Technologies, Inc. Independent consultant specializing in low-noise and nonlinear circuit analysis and design.
7/90 - 12/92	Associate Professor (tenured), UCLA, Department of Electrical Engineering.
3/86 - 7/90	Adjunct Associate Professor, UCLA, Department of Electrical Engineering.
11/89 - 7/90	Independent consultant.
10/85 - 11/89	Aerospace Corp. Conceive, plan, and perform research in microwave electronics, especially nonlinear and low-noise circuits. Position title: Research Scientist.
8/81-10/85	TRW, Electronic Systems Group. Developed receivers and receiver components in the 1-45 GHz range, including mixers, amplifiers, and multipliers. Developed GaAs MESFET and HEMT low-noise amplifiers a frequencies up to 45 GHz Developed the first active mixer above 45 GHz using a GaAs HEMT. Led the Microwave Advanced Development R&D project. Responsible for training of young engineers.

1/78-8/81 Hughes Aircraft Co., Space and Communications Group. R&D of advanced low-noise millimeter-wave receivers and components: mixers, FET amplifiers, filters, in microstrip, waveguide, and suspended stripline media. Developed mmW mixers with conversion losses below 3 dB. Led advanced development and R&D programs.

4/74-1/78 National Radio Astronomy Observatory. Developed the low-noise receivers for the Very Large Array. These two channel, four-band cryogenic radiometers used parametric amplifiers, mixers, and FET amplifiers between 1.2 and 24 GHz. Noise temperatures below 20 K were achieved. Also designed the back-end RF, analog, and control electronics and did thermal design of the cryogenics.

4/73-4/74 National Oceanic and Atmospheric Administration. Designed analog and digital electronics for a mobile LIDAR system used for atmospheric remote sensing.

OTHER ACCOMPLISHMENTS

- Recipient of the 1989 IEEE MTT-S Microwave Prize, 2002 IEEE MTT-S Application Award, and 2014 *Microwaves and RF* Legends of Microwaves award.
- Fellow of the IEEE.
- Member of IEEE MTT Administrative Committee 1990-93.
- Editor of the *IEEE Transactions on Microwave Theory and Techniques*, 12/89-3/92.
- Inventor of the GaAs MESFET resistive mixer.
- Author of the linear/nonlinear microwave CAD program C/NL2 and the nonlinear engine of Microwave Office.
- Registered Professional Engineer in California (No. E 015422).

RESEARCH INTERESTS

Nonlinear microwave circuit analysis; low-noise electronics, especially for microwave and mmW communications and radio astronomy; FET/HEMT applications; mixers; low-noise and power amplifiers; microwave systems; nonlinear computer-aided design; distortion phenomena; Volterra-series and harmonic-balance analysis.

PUBLICATIONS

Approximately 100 publications on monolithic circuits, low-noise receivers and components, large-signal modeling, nonlinear distortion, and computer-aided design.

Books: *Microwave Mixers* (Artech House, 1986; Second ed., 1992), *Nonlinear Microwave and RF Circuits* (Artech House, 1988; Second ed., 2003), *The RF and Microwave Circuit Design Cookbook* (Artech House, 1998). *Noise in Linear and Nonlinear Circuits* (Artech House, 2005), *Practical Microwave Circuits*, (Artech House, 2014).